



United States
Department of
Agriculture

Forest
Service

November, 2013



Environmental Assessment

**Stephens Production Company
Gas Well 1-15H Project
ARES 54692
Section 15 of T6N, R25W**

***Mt. Magazine Ranger District
Ozark National Forest
Logan County, AR***

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**ENVIRONMENTAL ASSESSMENT
FOR
STEPHENS PRODUCTION COMPANY
GAS WELL 1-15H PROJECT
ARES 54692
Section 15 of T6N, R25W
OZARK NATIONAL FOREST
MT. MAGAZINE RANGER DISTRICT
LOGAN COUNTY, ARKANSAS**

I. INTRODUCTION

A. DOCUMENT STRUCTURE

The Forest Service in coordination with the Bureau of Land Management (BLM) has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mt. Magazine Ranger District Office in Paris, Arkansas.

B. PURPOSE AND NEED FOR ACTION

The purpose of this action is to respond to an Application for Permit to Drill (APD) on the federal mineral estate submitted by Stephens Production Company. The APD proposed construction of a gas well, road work to access the well, construction of a drill pad, construction of a reserve pit, and construction of gathering lines. In addition, Stephens Production Company seeks to operate and maintain these facilities if the well is productive.

The United States of America owns the mineral rights to this area. These minerals are under an Oil and Gas Lease, Serial Number ARES-54692, issued to Chesapeake Exploration of Oklahoma City, Oklahoma with an effective date of lease of June 1, 2007. On September 2, 2011, Chesapeake Limited Exploration assigned 100% of this lease, ARES-54692 to Stephens Production Company.

This proposed action is needed because the lease grants Stephens Production Company the right to drill for, extract and sell the federal minerals located within the lease area. The Forest Service is the surface management agency responsible for approval of surface disturbing activities on National Forest Lands. The Bureau of Land Management would approve the drilling plan or “downhole” operations.

This action would help the nation’s oil and gas industry meet the U.S. annual demand of 22 trillion cubic feet per year of natural gas (Energy Information Administration 2006) and would comply with the Energy Policy Act. Estimated demand is 27 trillion cubic feet per year by the year 2030.

This action responds to the USDA Forest Service Strategic Plan for Fiscal Years 2007-2012 of helping meet energy resource needs (Land and Resource Management Plan, p. 1-6). It also helps to achieve:

- (1) the Land and Resource Management Plan (LRMP) desired condition of administering minerals and energy developments to facilitate production of mineral and energy resources as well as to minimize adverse impacts to surface and groundwater resources and protect or enhance ecosystem health (LRMP, 1-48), and
- (2) the LRMP priority of encouraging and facilitating the orderly exploration, development, and production of mineral and energy resources in order to promote self-sufficiency in those mineral and energy resources necessary for economic growth and national defense (LRMP, 2-29).

The proposed natural gas well, access road, and gathering lines are in Management Area 3.C (Mixed Forest) as described on pages 2-61 through 2-62 of the LRMP.

C. PROPOSED ACTION

The proposed action is for the Forest Service to approve the Surface Use Plan of Operations (SUPO) for the APD submitted for ARES 54692 USA#1-15H Gas Well. The SUPO describes and contains plans for surface occupancy including proposed access, pad plans, timing of operations, proposed surface restoration, and measures to be taken by Stephens Production Company to mitigate effects.

D. DECISION FRAMEWORK

The decision to be made is whether to approve subject to specified conditions, or disapprove for stated reasons, the Surface Use and Operation Plans for USA #1-15H Gas Well. Rob Kopack, Deputy District Ranger of the Mt. Magazine Ranger District, or his acting line officer has the authority to make this decision.

If a determination were made that the impact is not significant, then a "Finding of No Significant Impact" (FONSI) would be prepared. A Decision Notice would document the decision.

E. RELATED EIS/EA(S) THAT INFLUENCE THE SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

This EA is tiered to the Ozark-St. Francis NF Final Environmental Impact Statement (Ozark-St. Francis FEIS) and the Revised Land and Resources Management Plan (LRMP). The Ozark-St. Francis FEIS and the LRMP can be viewed at local U.S. Forest Service offices. Other documents incorporated by reference in this EA can be viewed at the Mt. Magazine District office in Paris, Arkansas.

F. PUBLIC INVOLVEMENT

Scoping for this project began with the mailing of the proposed action to adjacent landowners and interested citizens on April 12, 2013. This list included letters to eight Native American Tribes and the Arkansas Game and Fish Commission. The scoping package contained a description of the proposed action, a map depicting the proposed action, and a comment form. Thirty-four letters were mailed.

A legal notice requesting comments during the legal comment period was published on April 15, 2013 in the Times Record, a newspaper of daily circulation out of Fort Smith, Arkansas.

A copy of the proposed action letter was posted that same week on the Ozark-St. Francis National Forests website at http://www.fs.usda.gov/Internet/FSE_Documents/stelprdb5416382.pdf.

Three timely public responses were received from this scoping effort and are shown in Appendix A.

An interdisciplinary (ID) team of Forest Service individuals whose knowledge and expertise is critical to the management of this area (refer to Chapter IV.) also received this scoping.

II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. ALTERNATIVE 1 (PROPOSED ACTION ALTERNATIVE)

Alternative 1 is the proposal submitted by Stephens Production Company. in their APD for USA-1-15H Gas Well.

Stephens Production Company is proposing to construct a gas well on National Forest land. Preparation for this drilling activity would include roadwork to access the well, construction of drill pad, and construction of reserve pit.

If the well produces, production facilities would be installed on that drill pad and a gathering line would be installed from the production facilities to Green Bench Road. Production equipment to be installed on the drill pad would consist of, but not be limited to, a wellhead, a separator unit, a meter shed, a produced water tank, and if needed, a compressor and/or dehydrator. Maintenance of the location (including the access road, well pad, and gathering lines) would be required during the life of the well; mechanical (mowing), glyphosate herbicide, or both may be used to achieve this. Glyphosate herbicide would be applied using ground-based methods such as hand application using gloves, or spray using a backpack containing the herbicide attached to a flexible sprayer, wand or other hand application device that directs the chemical onto the target Non Native Invasive Species (NNIS) or weed. Any portion of the drill pad not used for the production site and defensible space would be reclaimed for use by the Forest Service. Upon depletion of reserves or abandonment of the well, the production facilities would be removed from the site and the entire area reclaimed as specified by the Forest Service.

If drilling results in a dry hole, the well casing would be plugged with cement below the ground surface in a manner approved by the Arkansas Oil and Gas Commission and the BLM and a location marker installed. The cleared area and the reserve pit would then be reclaimed as specified by the Forest Service.

Drilling operations are expected to begin upon approval of the SUPO by the Forest Service and the APD by the BLM. This is anticipated to be December 2013.

These activities are located in Section 15 of T6N, R25W of the Mt. Magazine Ranger District. This site is located approximately 2.0 miles west along Green Bench Road from State Highway 309 in Logan County.

Proposals for the well are as follows:

Table 1 Proposed Activities

Activity	Amount
<i>Drill Pad and Reserve Pit Construction</i> <i>(includes clearing limits)</i>	Approximately 4 acres
<i>Temporary Water Line Installation</i>	Approximately 1.56 miles of 3-inch plastic water line would be placed on the surface in the right of way along Green Bench Road.

Activity	Amount
Gathering Line Construction* (20-foot right-of-way along Green Bench Road)	Approximately 3,483 feet (1.60 acres)
Road Construction (30-foot right-of-way)	Approximately 647 feet (0.45 acre)
Road Maintenance/Improvements (Green Bench Road)	Cutting and pouring new cement at one creek crossing on the east side of Section 15 T6N, R25W.

**Gathering line would be buried approximately 20 feet from the centerline of the road on the back slope of the ditch in the road right-of-way.*

Drill Pad and Reserve Pit Construction

Approximately 3.88 acres would be cleared in the construction of a drill pad and a reserve pit. This includes an approximate 25-foot clearing limit around the pad and pit. Existing trees would be marked and sold to Stephens Production Company. Stephens Production Company would remove the merchantable timber from the Forest.

Whether a producing well or a non-producing well, upon completion of the drilling activities, samples of the cuttings and fluids remaining in the reserve pit would be analyzed by a licensed laboratory for its chemical and metal content. Based upon test results, mitigation may be required prior to closing. Mitigation may include, but not be limited to hauling the remaining fluids and cuttings to authorized disposal facilities.

Temporary Water Line Installation

The source of water required for drilling the proposed well would be obtained from an off-site private pond. Water used for the drilling operation would be piped through temporary water lines placed on the south side of Green Bench Road. The pipe would be a three-inch plastic water line on top of the surface. Daily water usage would be from an 8,400 gallon minimum to a 16,800 gallon maximum. Portions of the temporary waterline that are off the lease would be covered under a special use permit.

Gas Pipeline Gathering Line Construction

Approximately 3,483 feet of gathering line would be constructed. This gathering line would be installed with machinery such as a track hoe in the road right-of-way approximately 20 feet from the centerline of the road on the upslope side of the ditch. The gas pipeline would be buried to a minimum depth of 36 inches unless in solid rock, in which case the cover would be 18 inches with 6 inches of bedding under the pipe. The size of the pipe would be determined after the well is drilled and the production volumes have been analyzed.

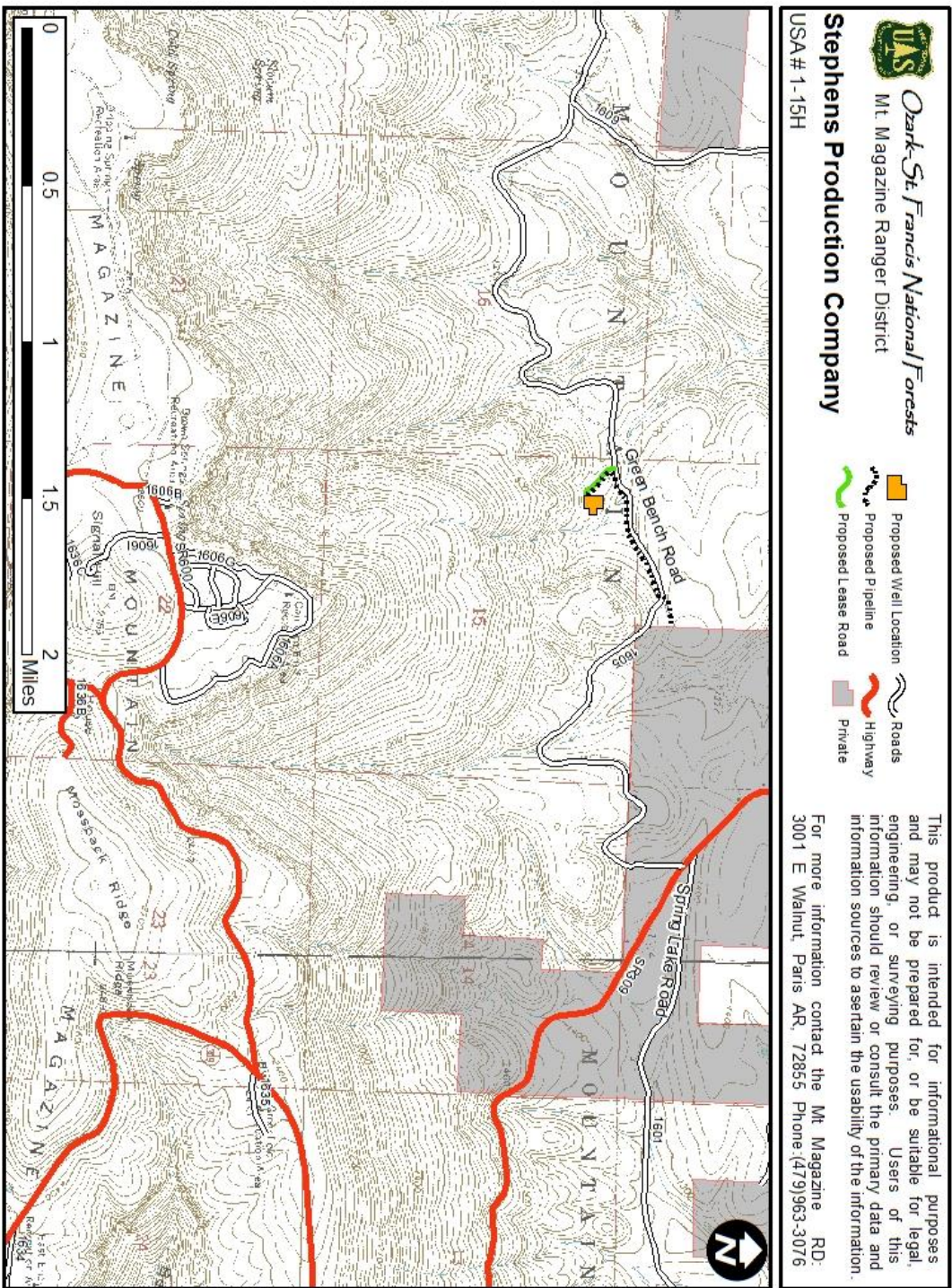
Access Road Construction

Approximately 647 feet of access road would be constructed for Stephens Production Company USA #1-15H. This road would not be added to the Forest Service road inventory. This access road would be gated approximately 100 feet from the junction with Green Bench Road to allow for safe entry and exit of the access road.

Road Maintenance/Improvements

Improvements to Green Bench Road would be done by cutting and pouring new cement at the creek crossing on the east side of Section 15 T6N, R25W. Safety signs would be required along roads and trails as directed by the Forest Service.

Figure 1 Alternative 1 Map



B. DESCRIPTION OF ALTERNATIVE 2 (NO ACTION ALTERNATIVE)

Under the no action alternative, the Surface Use and Operations Plan for Stephens Production Company USA # 1-15H would be denied for specific reasons. Stephens Production Company would not be allowed to construct this well and access to the area would be denied. The lessee would be denied the right to access the minerals held under the lease. The analysis of the no action alternative is required by the National Environmental Policy Act (NEPA).

C. ALTERNATIVES ELIMINATED FROM DETAILED STUDY

No other alternatives were proposed for consideration.

D. PROJECT DESIGN CRITERIA

For each alternative, all applicable design criteria or standards in the Revised Ozark-St. Francis Land and Resources Management Plan would be applied to reduce potential effects.

Below are specific criteria for this project.

- 1) Machinery noise that has the potential to disturb wildlife, livestock, and private landowners or neighbors would be controlled to reduce sound levels. Suitable mufflers would be installed on all internal combustion engines and certain compressor components. Engineered sound barriers or sound-insulated buildings may be required to meet Federal Energy Regulatory Commission (FERC) standards for sound levels.
- 2) The current specified environmental paint color "shale green" that allows facilities to blend in with the natural landscape background would be required for permanent and semi-permanent equipment. This would enable the facilities to blend in as seen from a viewing distance and locations typically used by the public. The paint color and specifications are listed on the Bureau of Land Management (BLM) Standard Environmental Colors Chart CC-001: June 2008.
- 3) Individual or combinations of erosion control features including straw bales, silt fences, rock filters, and sediment basins would be placed at the ends of all drainage ditches constructed around the project area and at the toe of fill slopes to filter any sediment that might be contained in the runoff.
- 4) A minimum depth of six inches of loose depth gravel would be spread on the access road. All of the driving surface will be armored and anything not armored will be vegetated.
- 5) Three culverts would be placed on the access road as directed by a Forest Representative. One culvert would be placed on Green Bench Road with the intersection of the access road.
- 6) Stephens Production Company would be required to follow the road maintenance agreement or obtain appropriate road permits for use of Forest Service roads.
- 7) Clearing and soil disturbance would be held to the minimum area needed. All fill material, boulders, and debris would be retained in the flagged drill site boundary and would be placed as directed by a Forest Representative. Topsoil would be stockpiled at points designated by the Forest Representative.
- 8) Drill pads would be constructed in successive lifts no greater than eight-inch layers each compacted uniformly until visual displacement ceases, including the fill slope. The fill slope would not exceed a ratio of 3:1.

- 9) During site preparation and drilling preparations; trash, garbage, paper, cans or other debris would be contained at all times in an approved receptacle and disposed as needed at an approved sanitary landfill.
- 10) During all construction and drilling operations, a restroom facility would be located on site.
- 11) Site rehabilitation of the drill pad sites would begin as soon as drilling operations are complete and the weather permits. The operator would be required to rip compacted sites to a minimum depth of 12" and spread the stockpiled topsoil uniformly over the site. The Forest Service would specify the species of grasses, shrubs and/or trees to be planted. Restoration would be considered satisfactory when a summer survival of desired grasses provide at least an average 80% cover evenly distributed over the site outside the areas used for production equipment and roadway. Tree and shrub planting would be considered successful when there is at least 80% survival, evenly distributed over the area, one year after planting.
- 12) When Stephens Production Company no longer needs the drill sites, revegetation work would be repeated until the sites are satisfactorily revegetated and approved in writing by a Forest Service Representative.
- 13) There would be only one reserve pit per well site.
- 14) The walls of the reserve pits would be less than ten feet in height above the natural surface, measured from the outside of the pit. There would be at least a 3:1 slope on the interior wall and a 2:1 slope on the exterior wall. The wall material would be placed and compacted in approximately 6-8" lifts. The pits would be built so that no surface runoff from outside the wall of the pit enters the pit.
- 15) The Forest Service would require the interior of the reserve pits to be lined with a material that meets a hydraulic conductivity standard of 10^{-7} .
- 16) Water would not be allowed to fill the reserve pits any higher than within two vertical feet of the lowest point of the wall.
- 17) Drill cuttings and/or drilling fluids in the reserve pits would be hauled to an approved disposal site off National Forest land.
- 18) Stephens Production Company would be responsible for monitoring the water quality in the reserve pits. Stephens Production Company would insure that water samples are both collected and analyzed by a laboratory approved by the Forest Service. A letter from the Ozark-St. Francis National Forest Supervisor (July 10, 2008) to the District Rangers and Staff outlines the pit sampling requirements for gas well activities.
- 19) Merchantable timber would be purchased and disposed of off Forest.
- 20) Except for those areas needed for access and/or production, areas where soil has been disturbed would be reseeded. The seeding includes cut-and-fill slopes, ditches (wing, lead-off, etc.), shoulders, and any other exposed areas created by the project. Seeding specifications would be provided by the Forest Service.
- 21) Stephens Production Company would post signs along Green Bench Road (FDR 1605) to notify road users of activity in the area. Particular attention would be paid to posting signs where the Mt. Magazine Hiking Trail crosses Green Bench Road. Specifications, placement, and spacing of the signs would conform to the Manual on Uniform Traffic Control Devices for Streets and Highways (2009 Edition including Revision 1 dated May 2012 and Revision 2 dated May 2012, U.S. Department of Transportation Federal Highway Administration).

- 22) Under Section 404 of the Clean Water Act, anyone who proposes an activity that would discharge dredged or fill material into waters of the United States is required to apply for a permit from the U.S. Corps of Engineers. It would be Stephens Production Company's responsibility to obtain this permit from the U.S. Corps of Engineers.
- 23) Heritage resource sites that are determined eligible for the National Register of Historic Places and sites that have undetermined eligibility would be protected from any ground-disturbing activities associated with this project. If additional heritage resource sites are found during implementation of this project, they would be examined and necessary mitigation measures prescribed by the Forest Archaeologist would be implemented.
- 24) A review of listings and locations of all known occurrences of proposed, endangered, threatened, or sensitive species (PETS) has been conducted. In addition, field surveys have been made on all stands to be impacted by each of the action alternatives. No critical or essential habitat for any PETS species was identified in the project area. If any additional PETS species are discovered prior to or during implementation, the project would be halted and a new biological evaluation would be made to determine the effects on the species and its habitat.

III. ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social, and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives.

The revised Forest Plan was developed with public input from 2001-2005. Impacts from potential minerals development on National Forests were based on the 2004 Reasonable Foreseeable Development Scenario (RFD) developed by Bureau of Land Management (BLM). Areas available for lease were determined in the Revised Plan and associated EIS. Lands available for leasing are very similar to the prior (1986) plan.

The RFD is a projection from BLM in regard to the number of wells and the associated surface disturbance that may occur over a ten year period, broken down by type of well, county, etc. In 2007, the Forest requested an updated RFD from BLM. The final version of the new RFD, that shows a date of 2008, was submitted to the Forest Service in 2009. Based on the new information in the updated RFD the Forest conducted a Changed Conditions Analysis (CCA) and Supplemental Information Report (SIR). The data from the revised 2008 RFD was analyzed by Forest specialists in the CCA and included all surface disturbance activities associated with the potential gas well drilling, such as well pads, roads and pipelines. So far, actual gas well development on the forest has been at a slower rate than predicted in the 2009 RFD. Development has been approximately 3% of the predicted level.

The possible disturbance predicted in the updated RFD was as many as 1,730 wells impacting 10,316 acres over a ten-year period. This would equate to 1,032 acres annually. Disturbance areas would be small, generally two to seven acre disturbances, and most disturbance would be short term, lasting from several weeks to several months. The sites would be dispersed across the Forest and would occur over a ten- year period. After drilling had occurred, the locations would be partially reclaimed. Based on the analyses disclosed in the CCA, the current direct, indirect, and cumulative effects of ongoing land management activities on Ozark National Forest and the additive impacts regarding the new RFD gas well development predictions are minimal and do not measurably exceed the scope of the effects previously analyzed in the Revised Forest Plan's Final Environmental Impact Statement. Based on the CCA, the SIR concluded that protections in the forest plan were adequate to address the potential increased surface disturbance and that a Forest Plan Amendment was not needed. From 2006 through 2013 forty one producing natural gas wells, five exploratory wells, and two non producing or dry holes have been developed on the Forest which is much less than that predicted by the revised RFD. During the last two years, no natural gas wells have been developed on the Forest.

A. SOIL

Existing Condition

The analysis area for soil is the area covered by the clearing limits for the drill pad and reserve pit, gathering lines, and associated road work.

The soil type for Stephens Production Company No. 1-15H is Nella-Enders association, 8-20% slopes (Garner et.al. 1980).

Nella-Enders association is made up of 60 percent Nella soils, up to 30 percent Enders soils, and included soils make up the rest. This association consists of deep, well-drained, loamy and clayey soils. Nella soils are moderate in organic content, low in natural fertility, and strongly to very strongly acid. Permeability is moderate and the available water capacity is medium. Enders soils are well drained, moderate in organic content, low in natural fertility, and strongly to extremely acid. The soils in this association are unsuitable for cultivated crops because runoff is rapid and erosion is a very severe hazard. These soils have fair potential for use as pasture but most areas are used as woodland for shortleaf pine, loblolly pine, and northern and southern red oak.

The hazard of erosion off-roads and off-trails for the soils in the project area is slight. Ratings for the hazard of off-road or off-trail erosion are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of slight indicates that erosion is unlikely under ordinary climatic conditions; moderate indicates that some erosion is likely and that erosion-control measures may be needed; severe indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and very severe indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical (NRCS).

The hazard of erosion on roads and trails for the soils in the project area is slight. Ratings for the hazard of erosion on roads and trails are based on the soil erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of slight indicates that little or no erosion is likely; moderate indicates that some erosion is likely, that the roads or trails may require occasional maintenance; and that simple erosion-control measures are needed; and severe indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion control measures are needed(NRCS).

Soils in the analysis area are covered with a layer of pine needles and leaves, tree limbs, and twigs. Stumps in the area are evidence that the area has been harvested in the past. There is an old road running through the area. There are piles of soil along the side of the old road that were mostly likely placed there during construction of the road.

The northwest corner of the proposed gas well pad slopes to the northeast toward the ephemeral stream, which is about 450 feet away. The northwest and central parts of the proposed gas well pad are on a low ridgetop. The slopes on the east side of the proposed gas well pad face west toward the low ridgetop. The southwest part of the proposed gas well pad slopes to the northwest toward the low ridgetop.

Effects

Alternative 1

Clearing of the drill pad may initially increase erosion on this site. Sediment would be trapped by silt fences and sediment basins. Disturbed soils would be protected by vegetation slash, roots, rocks, limbs and other debris during clearing. During clearing the cleared area would be smoothed and tracked with

the dozer to prevent runoff from concentrating before storms occur. Soil would be cut on the east side of the proposed gas well pad and pushed toward the low ridgetop on the west. The soil on the south side of the proposed gas well pad would be cut and pushed toward the low ridgetop on the north. All cutting and filling would be done within the clearing limits with the exception of waterbars and terraces, which would extend beyond the clearing limits to allow sediment to settle out onto the undisturbed forest floor. During construction everything will be done within the clearing limits in an effort to retain all sediment within the clearing limits. Work will only be done outside the clearing limits during the interim and/or final reclamation processes for erosion control and establishing vegetation. Erosion control measures such as silt fences, sediment basins, and hay bales would be installed when clearing of the site is completed. The drill pad would be surfaced with aggregate. Additionally the trees, shrubs, and litter covered soils outside the clearing limits will help to capture sediment that escapes other erosion control measures listed in the Surface Use Plan of Operations. Erosion on the cleared area is expected to be deposited onsite because most of the proposed gas well pad would be on the low ridgetop.

Design Criteria #3 would prevent sediment or runoff from entering stream channels which would be approximately 175 feet east of the well pad on the east side, 450 feet northeast of the proposed northwest corner of the pad and 200 feet west of the drill pad.

Erosion would increase during access road construction and gathering line installation but would decrease when vegetation becomes established. The erosion rate would increase with an increase in rainfall intensity and amount. Plants in the erosion control seed mix germinate within 10 to 14 days, if weather conditions are favorable. Vegetation should be established within six months if weather conditions are favorable. Changes in road grade along with lead-off ditches would cause sediment to settle out on the undisturbed forest floor at the outlet of lead-off ditches. The gathering line (pipeline) would be installed in a trench dug with a backhoe and/or a trencher in a 20 foot wide right-of-way along the access road and adjacent to Green Bench Road. Top soil overlying the area to be trenched would be stock piled to be used for rehabilitation of the disturbed area. The six inch in diameter pipe would be placed in the trench and covered with subsoil followed by topsoil. Restoration would begin immediately after the trench is backfilled as described in the Surface Use Plan of Operations as contained in the Application for Permit to Drill (APD). Implementing the project design criteria would decrease erosion potential.

Up to 3.88 acres of soil would be taken out of vegetative production and devoted to the gas well drill pad and reserve pit. Approximately 0.45 acre of soil would be taken out of production and devoted to the access road. A total of 4.33 acres would be taken out of vegetative production and devoted to the access road, drill pad, and reserve pit. The soil in the right of way where the gathering lines would be installed would be excavated and exposed to erosion processes for ten to fourteen days before vegetation germinates and up to six months for the vegetation to become fully established depending upon weather conditions. Top soil from the drill pad area would be stock piled and stored for use during rehabilitation. If the well produces, part of the well pad would be rehabilitated and the remaining pad would be reduced to approximately 0.82 acres. Reserve pit standards would be laid out in coordination with the Forest Service and BLM and would be followed during installation of the pit. All waste would be removed from the site and disposed of in an appropriate landfill. Arkansas Oil and Gas Commission standards would also be followed.

In the case of a dry hole, and/or abandonment, the downhole requirements established by the BLM and the Arkansas Oil and Gas Commission to protect the environment and provide for safety would be incorporated. Requirements for abandonment, signage, etc. are listed in Arkansas Oil and Gas Commission General Rule B-9.

The rehabilitation of the surface as described in Project Design Criteria #12 would comply with Forest Service regulations and would be done in a timely manner to Forest Service specifications.

Glyphosate herbicide would be used as a spot application after the well pad is completed to keep the well pad clear of vegetation and to control invasive plant species. Herbicide use for this purpose is not

broadcasted but applied by direct injection, cut surface, or foliar spray. Glyphosate is readily absorbed by foliage. In general, glyphosate will bind tightly to soil and its leaching capacity is extremely low, i.e. glyphosate is relatively immobile (e.g., Alex et al. 2008, Landry et al. 2005, Mamy and Burruso et al. 2005) as cited in Syracuse Environmental Research Associates, Inc. 2011). It is strongly adsorbed to soil, remains in the upper soil layers, and has a low propensity for leaching (U.S. E.P.A 2013). Glyphosate readily and completely biodegrades in soil even under low temperature conditions. Its average half-life in soil is about 60 days (U.S. E.P.A. 2013). There is relatively detailed literature regarding the effects of glyphosate and glyphosate formulations to terrestrial microorganisms. While the mechanism of action of glyphosate in plants is also relevant to microorganisms, there is little indication that terrestrial microorganisms will be adversely affected by glyphosate (Syracuse Environmental Research Associates, Inc. 2011).

Cumulative effects include the combination of direct and indirect effects from past, present, and reasonably foreseeable activities. Direct, indirect, and cumulative effects on soils are measured within each activity area although adjacent land in stand 5 (118 acres) of compartment 42 outside of the activity area is considered as well in regards to slope stability. New system roads are discussed to provide extent of impacts but essentially are considered dedicated lands.

Evaluation of cumulative effects to soil productivity does not require an integrated “watershed-type” assessment since that is not considered an appropriate geographic area. This is because assessment of soil quality within too large an area can mask or “dilute” site specific effects and because of the variability in soil texture, the amount of organic matter and ground cover, soil response to past projects, and the intensity of the past project.

Up to 3.06 acres of the soil that is initially, disturbed would be rehabilitated by shaping and having top soil spread over the surface and be returned to vegetative production if the well produces. If the well does not produce, the entire disturbed area would be rehabilitated.

No cumulative effects are anticipated because there are no other past, present, or future actions whose effects on soils would add to the impacts to soil productivity from the proposed action. Impacts to soil productivity would be limited to the activity areas, which consist of the clearing limits for the well pad, the clearing limits for the access road and the clearing limits for the gathering line.

Alternative 2 (No Action)

There would be no increase in soil disturbance. Soil impacts would be limited to the existing road system and on-going forest management activities. At this time there are no other specific reasonably foreseeable forest management actions planned within the area of effects.

B. WATER

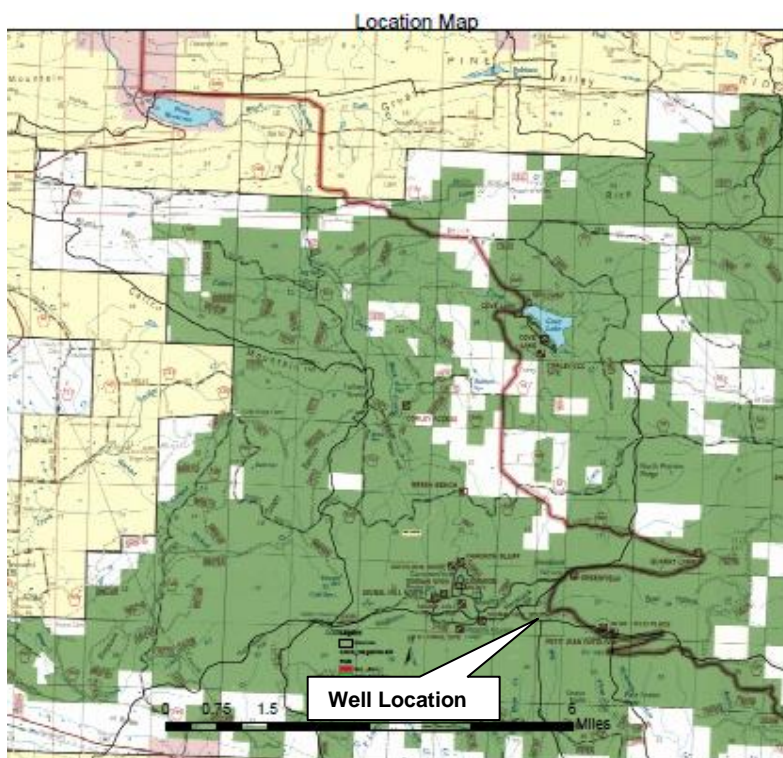
Existing Condition

The watershed containing the proposed well is the Upper Short Mountain Creek watershed (Hydrologic Unit Code 111102020106) which serves as the analysis area boundary for surficial effects. This watershed contains 29,359 acres, of which, 17,149 acres or 58% is National Forest System land. According to the Arkansas Oil and Gas Commission website, there are approximately 39 previously drilled and active wells within the watershed, three of which have been drilled in 2011 or later. See Figure 4.

The closest streams to the proposed well site are Gutter Rock Creek and its unnamed tributaries. Gutter Rock Creek becomes a perennial stream approximately 4,200 feet northwest of the proposed well site and flows northward and into Short Mountain Creek, which empties into the Paris Reservoir. The nearest tributary to Gutter Rock Creek is an ephemeral stream approximately 175 feet east of the proposed well pad.

Several defined channels are also present in the area. The definition of a defined channel is a feature that clearly exhibits most of the following characteristics: displays signs of water flow velocity sufficient to move soil material, litter, and fine debris; shows a defined bank and streambed; shows accumulated deposits of sands and gravels; and is continuously connected with other hydrologic features (LRMP, p. A-9). This includes channels that may only support water flow immediately following a precipitation event; bed forms that can include large, stable rock; and areas that possibly support riparian-dependent plants and animals. Furthermore, defined channels would not support year-round aquatic organism habitat.

Figure 2. Location Map



Gutter Rock Creek has not been monitored by the Forest service or ADEQ for water quality criteria. There is no evidence to suggest that water quality standards are not being met at this time. The streams are expected to meet the designated uses identified by ADEQ Regulation No.2 (Arkansas Pollution Control and Ecology Commission, 2011).

There are no registered wetlands identified within the project area. This determination was made by comparing the project area to the National Wetland Inventory database and by a field visit to the site. No floodplains were identified within the project area but floodplains do exist within the watershed in narrow strips along some of the stream courses.

There are no designated Wild and Scenic Rivers or impaired waterbodies within this analysis area.

The project area geology consists of Pennsylvanian age clastic sedimentary rocks of the Atoka, Hartshorne and McAlester formations (McFarland, 2004) as illustrated in the stratigraphic column depicted below. These are primarily sandstones and shales that are not particularly good aquifers. Therefore, the base flow contributions necessary to maintain perennial streams are highly variable and associated with seasonal climatic variation. This is further documented by the Arkansas Geological Commission's (1975) low-flow determination of Spring Creek and nearby Chickalah Creek indicating base flows (exceeded 90% of time) of 0.1 and 0.0 cubic feet per second, respectively.

Figure 3 Geologic Stratigraphic Column

Period		Ozarks	Ouachitas
CARBONIFEROUS	PENNSYLVANIAN		Boggy
			Savanna
			McAlester
			Hartshorne
		Atoka	Atoka
		Bloyd	Johns Valley
	MISSISSIPPIAN	Hale	Jackfork
		Prairie Grove	
		Cane Hill	
		(Ima)	Stanley
		Pitkin	
		Fayetteville	
		Batesville	
		(Ruddell)	
		Moorefield	
		Boone	
		St. Joe	Arkansas Novaculite (part)

From Arkansas Geological Survey website

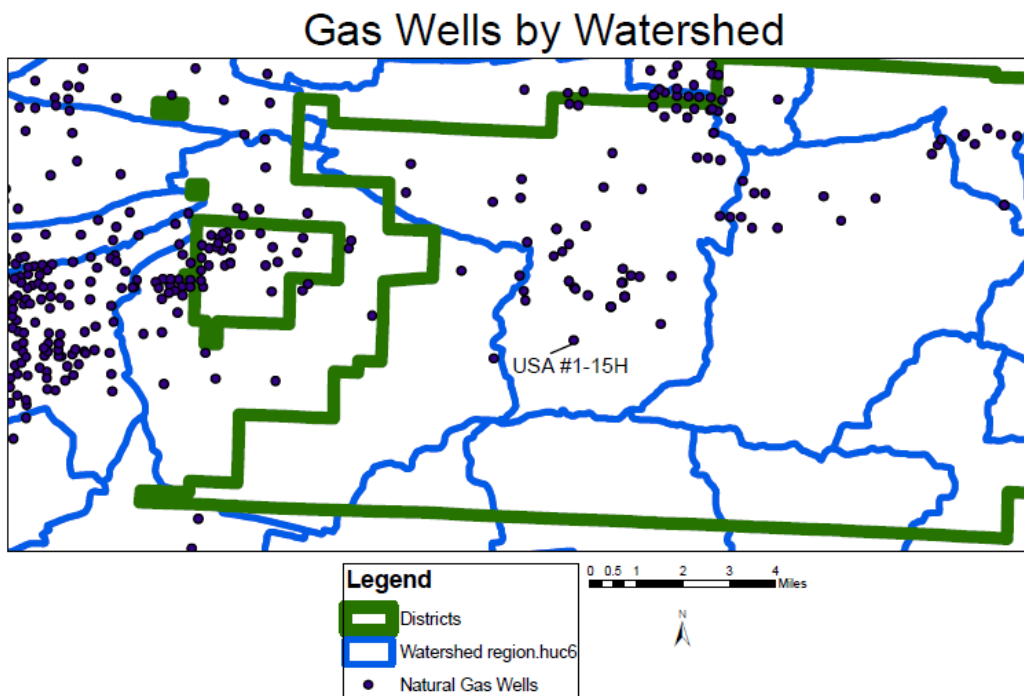
Project area geology is shown in the upper portion of the right column of Figure 3. above. The McAlester Formation is present at the surface in the project area and is approximately 300 feet thick at the proposed well location. This formation consists mostly of shale with thin beds of sandstone and coal. It rests conformably on the Hartshorne Formation, which is composed of medium-grained sandstone and ranges in thickness from 10 to 300 feet. Neither of these formations is considered a good aquifer although some groundwater may be obtained from the limited formation permeability or from fractures that may collect and transmit larger volumes of water. Stephens Production Company has proposed surface casing on this well to a depth of 800 feet, which would isolate the well from any usable groundwater encountered. The surface casing would be cemented in place for its entire length in order to isolate any water that is economically accessible.

The target zone for gas extraction is the Basham Sandstone Member of the Middle Atoka Formation. According to the Arkansas Geological Survey, the Atoka Formation is described as a sequence of marine,

mostly tan to gray silty sandstones and grayish-black shales. Some rare calcareous beds and siliceous shales are known. This unit has the largest areal extent of any of the Paleozoic formations in the state. It is the surface rock of the Boston Mountains and dominates the exposures in the Arkansas River Valley and the frontal Ouachita Mountains. It is also present in the southern part of the Ouachita Mountains. In the Arkansas River Valley and the frontal Ouachita Mountains, the Atoka Formation has been subdivided into upper, middle, and lower lithic members based on regionally mappable shale or sandstone intervals. The unit locally contains discontinuous streaks of coal and coaly shale in the Boston Mountains and Arkansas River Valley. Fossil plants, generally poorly preserved, are common throughout the section. Poorly preserved invertebrate fossils are much less common than plant fossils, but have been reported from several horizons. Trace fossils are relatively common in the Atoka Formation. The formation is conformable with the Bloyd Shale in the Boston Mountains and with the Johns Valley Shale in the Ouachita Mountains. The unit may be up to 25,000 feet in thickness in the Ouachita Mountains, although only large incomplete sections are known.

Figure 4. below shows the location for the proposed natural gas well and other existing gas wells in the area.

Figure 4 Gas Wells within Watersheds



The well would be drilled through the McAlester and Hartshorne Formations, through the Upper Atoka, and into the Middle Atoka. At a measured depth of 5,577 feet, the drill bit would begin to veer eastward at 10 degrees per 100 feet until a total vertical depth of 6,150 feet is reached in the Basham Sandstone. From that point, drilling would commence at a slight upward angle for a total horizontal distance of 2,679 feet, ending at 6,050 feet total vertical depth.

According to Exhibit F of the Application for Permit to Drill, there are no existing gas wells within a one-mile radius of USA 1-15H. From the U.S. Geological Survey well mapper internet site (<http://ar.water.usgs.gov/PROJECTS/WWData.html>), there are five private ground water supply wells within one mile of the proposed well site, the deepest of which is 602 feet deep, produces four gallons per minute, and is registered as a domestic supply well. There would be over 5,000 vertical feet of rock

between this domestic well and the bottom of the gas well. Information on each well is shown below.

Table 2 Private Ground Water Supply Wells within a one-mile radius of USA#1-15H

Well Number	Total Depth (Feet)	Static Water Level (Feet)	Water Yield (Gal/Min)
933752351156	100	Dry	None
933758351156	460	65	300
933803351158	602	47	4
933858351202	80	30	8
933739351159	120	25	4

Groundwater in the Ouachita and Arkansas Valley region primarily occurs in either the alluvial aquifers of the Arkansas River and its tributaries or in fractures of the underlying consolidated rock. The fractures, or joints, in rock provide secondary porosity and permeability to collect and transmit water. They do, however, pinch out with depth, decreasing their water-bearing significance. The considerable thickness of different shale units in the area tends to act as a barrier to vertical migration of waters within the bedrock. Average depth to groundwater in the region is less than 30 feet in over 90% of wells and less than 20 feet in over 75% (Cordova, 1963). Approximately 75 households in the Corley area northeast of the proposed well site were recently connected to municipal water (Paris Accounting Office, personal communication). Not all households requested municipal water so some are still utilizing wells as their primary water source. Customers on this new line began being billed in June 2013.

In the study by Cordova (1963), dissolved solids in groundwater ranged from 37 to 1,450 parts per million (ppm). Of the 64 samples collected, 81% contained less than 500 ppm, which is the recommended limit for drinking water according to the Environmental Protection Agency (EPA) website (<http://water.epa.gov/drink/contaminants/index.cfm>). The iron content of these samples ranged from 0.00 to 19 ppm with approximately 50% exceeding the EPA's secondary drinking water standard of 0.3 ppm. Waters from the Atoka and Hartshorne Formation generally exceeded 2.0 ppm. The concentration of 4.0 ppm of iron was exceeded in 11% of wells sampled, mostly from the Atoka Formation.

Several known springs are present within two miles of the proposed well site. These include Burnett Spring, Brown Spring (northwest of the proposed site), Bray Spring, Slocum Spring, Cold Spring, and Brown Spring (south of the proposed site). The closest spring to the proposed well site is the Brown Spring 1¼ miles south, which, along with Cold Spring, issues from the overlying Savanna Formation that makes up Mount Magazine. The remaining springs within two miles issue from the McAlester, Hartshorne, or Upper Atoka.

All downhole activities are described in the Application for Permit to Drill and regulated by the Bureau of Land Management (BLM). As part of the regulations, testing can be required of the water wells before and after drilling if deemed appropriate by BLM. For example, if local drilling or geologic conditions, such as downhole stratigraphy involving faults, fissures, natural fractures, karst/limestone or other similar conditions require extra vigilance in detecting leaks of wellbore fluids into the usable water, then additional testing for baseline water could be required by the BLM as a condition of approval (COA) of a drilling permit.

Effects

Alternative 1

Direct Effects - Clearing of the drill pad along with road and gathering line construction may initially increase erosion from the site. This would be temporary because the drill pad and access road would be surfaced with aggregate. The use of silt fencing and/or hay bales, and slash would also help to control erosion and prevent movement of sediment into streams

The use of Glyphosate as an herbicide is expected once the well pad is completed. This herbicide would be used only as spot application to keep the well pad clear of vegetation during use and to control invasive species. Herbicide use for this purpose is applied by direct injection, cut surface, or foliar spray. For these purposes, herbicide use is infrequent and direct application methods would minimize off-site movement. Forest-wide Standards for herbicide application would be followed as well as appropriate BMPs designed to limit risk to water quality.

Fracturing of the rock around the drill hole in the target zone for natural gas is necessary to create pathways for gas to be extracted thru the drill hole. The fracturing process is closely monitored to ensure fractures are not propagated outside the target zone, creating a route thru which the gas could escape and not be captured.

Although nitrogen fracturing techniques would be used in this well, some water would be required for carrying proppants (sand) and chemicals such as scale inhibitor, acid for cleaning cement from the casing perforations, friction reducers and surfactant to increase the viscosity. No diesel would be used during the fracture process of this well. Typical fracturing fluids consist of 99.51% water and 0.49% other liquids as noted above (AOGC website). The fracturing treatment would consist primarily of 70% nitrogen and 30% liquid. Nitrogen is delivered to the site as a liquid and is warmed to a gaseous state prior to pressurized injection. The inert gas imparts energy into the formation so that more of the liquid is expelled upon release of fracturing pressure (John Reiss, BLM Reservoir Geologist, personal communication). The gas exits the formation thru the well bore as nitrogen gas, which already makes up 78% of the atmosphere.

Total water use for fracturing existing gas wells in the area is approximately 10,000 barrels or 420,000 gallons per natural gas well. This water would be obtained from private land and pumped approximately 3 miles by overland pipe to the site. Typical recovery is approximately 10-20%. There would likely be another 1-2 barrels per day of produced water that would be stored on-site. Produced water is groundwater that is encountered during the drilling process or from water vapor from the target formation that is expelled during gas extraction. Water that comes back to the surface would not go into the cuttings pit but would be stored in tanks at the site and hauled by truck to authorized disposal facilities. The company has an established Spill Prevention, Controls and Countermeasures (SPCC) plan and spill reporting guide, which requires notification of designated local, state and federal officials should a spill, occur in reportable quantities.

Although possible, it is considered unlikely that the well would undergo another fracturing process in the future to revitalize the well. Gas wells in the area utilizing the same formation have an anticipated life expectancy of 15-40 years.

Although naturally occurring methane is typically encountered during drilling operations, it is not anticipated to be produced at levels high enough to affect climate change. Stephens Production Company routes all methane captured during the flowback and completion process to a completion combustion device as required by EPA's 40 CFR Part 60, subpart OOOO emission standards.

After drilling is complete, cuttings would be removed from the mud pit and hauled by truck to a designated disposal facility. These materials are subject to the same spill prevention and reporting requirements as liquid waste. Disposal of all liquid and solid wastes would involve driving across bridges over streams. Transportation of these materials has no higher risk than any other typical transport and spills or accidents are covered by the SPCC plan and are subject to applicable state and federal regulations.

Potential impacts from field operations associated with gas wells could include migration of oil, gas or contaminated water through poorly cemented or corroded well casings. Regulations require that the well construction procedures be designed in such a manner to reduce the potential for contamination of any aquifers. All downhole activities are subject to the standards and requirements of the Bureau of Land Management (BLM). This includes approval of the type of equipment used downhole, cementing of the

surface casing, and, eventually, proper abandonment of the well. Reserve pit standards are laid out in coordination with the Forest Service and BLM and must be followed during installation of the pit. All waste must be removed from the site and disposed of at an appropriate waste disposal facility. Arkansas Oil and Gas Commission standards must also be followed. Adhering to these standards and requirements should prevent contamination of any aquifers in the area.

Upon completion of drilling activities, the rehabilitation of the surface would comply with conditions contained in the approved permit, the Forest Wide Conditions of Approval, and the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, The Gold Book. Reclamation activities would be completed in a timely manner and subject to acceptance by Forest Service personnel.

Indirect Effects – Water quality may be affected by indirect effects at a later time or further distance from the triggering management activity. Indirect effects are from management activities that do not have a direct connection to a stream course or water supply.

The proposed activities where ground disturbance would occur have potential to adversely affect water quality by increasing sediment levels and changing the chemical and biological characteristics of the water quality within a watershed that could have detrimental effects to fish and public water supply however; impacts from this project are not expected to contribute to degradation of the current water quality. The most likely effects from this alternative, beyond current conditions, are a short-term increase in sediment that would result from storm runoff following construction activities. Erosion control through revegetation of the disturbed ground, use of silt fencing, slash and other catchment devices, and contouring of the slopes would limit the expected erosion and runoff. Using measures that would minimize run-off and help to establish natural vegetation would limit long-term concerns to water quality.

Cumulative Effects –The aquatic cumulative effects model was used to capture the effects of other management activities in the same watershed that may combine with the proposed project to produce cumulative effects. Changes in land use and other disturbances can be modeled with respect to estimated increases in sediment. This model estimates the current condition and the effects of various management alternatives. These predictions are then compared to risk levels established by the effects of sediment increase on fish communities. Other projects included an estimate of other gas wells drilled in the same watershed in the last three years. There are approximately 39 other well pads in the watershed, most of which are on private land. It is estimated that two of these wells were completed in each the last three years and that they each contain approximately four acres of cleared area. The closest activity to construction of a well pad that is listed in the model is construction of a pond. Timber is completely removed from these sites so in the cumulative effects model, 8 acres of clearcut and 8 acres of pond construction are used for past activities.

Within the model, the analysis area watershed starts with a rating of Moderate. This is because 41% of the watershed is private land and includes over 3,400 acres of pasture, cultivated, and urban land. After applying the proposed activities, the rating for the watershed remains as a moderate risk to water quality.

No cumulative effects are expected to occur due to sub-surface or downhole activities because no past, present, or future activities are expected to overlap with the proposed activities. The nearest existing natural gas well is approximately 1 mile from the proposed natural gas well and the nearest natural gas well that is proposed for drilling in the future is approximately 1.5 miles from the Stephens well proposed in section 15. Any subsurface effects from the proposed natural gas well are not expected to overlap with any of the five domestic ground water supply wells within one mile of the proposed natural gas well site. The limited permeability of the underlying rock, the narrowing and disappearance of fractures in the rock with depth, and the surface casing which separates the drill hole from the adjacent earth and rock to a depth of 800 feet below the surface serve to limit the potential migration of contaminants into ground water, existing water wells, and other existing or future natural gas wells.

Alternative 2 (No Action)

For the No Action alternative, any additional risk to surface water quality from construction of the well pad and access road would not be realized. Existing processes would continue and the watershed would remain at moderate risk for effects to surface water quality. The already low risk to groundwater would be further diminished since the well would not be drilled.

Table 3. Results of the Water Resources Cumulative Effects Analysis

Percent increase of sediment above undisturbed conditions						
	Current		Future			
			No Action		Proposed	
6th level Watershed Analysis Area	% increase	Concern Level	% increase	Concern Level	% increase	Concern Level
111102020106 Upper Short Mountain Creek	402	Moderate	407	Moderate	409	Moderate

C. AIR QUALITY

Existing Condition

The analysis area for air quality is Logan County because air quality is reported by county. A subset of the analysis area is the Short Mountain Creek Watershed (29,356 acres) surrounding the gas well site.

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The NAAQS establish thresholds for six pollutants that adversely impact public health and the environment: sulfur dioxide, nitrogen dioxide, ozone, particulate matter, lead, and carbon monoxide. Construction equipment and vehicles emit volatile organic compounds (VOCs), sulfur oxides (SO_x), and nitrogen oxides (NO_x), which can contribute to the formation of ground-level ozone. Construction equipment and vehicles may also produce dust during activities, which can add to fine particulate matters in the atmosphere.

In general, the air quality in the analysis area is good (U.S. Department of Agriculture, Forest Service 1999). Episodes of regional haze occur mainly in the spring and summer due to higher humidity, which causes sulfate particles, which are one of the particles that cause haze, to scatter more light. Eastern states have higher sulfate levels in the air compared to western states.

Proposed activities are within Logan County. As of December 14, 2012, Logan County was in attainment for all the six EPA criteria air pollutants (U.S. Environmental Protection Agency 2012). EPA defines attainment areas as "A geographic area in which levels of a criteria air pollutant meets the health-based primary standard (national ambient air quality standard, or NAAQS) for the pollutant". EPA defines non-attainment areas, as "A geographic area in which the level of a criteria air pollutant is higher than the level allowed by the federal standards".

Based on LRMP standards, the desired condition for the air resource in the analysis area is to meet NAAQS.

There are 2,680 natural gas wells in Logan County.

Effects

Alternative 1

Vehicles travelling to and from the site would be a source of emissions. During drilling and completion of the well approximately 250 to 300, round trips would be made by trucks during the construction, drilling and nitrogen fracturing operations. The average trips by the crew, miscellaneous workers, vendors and others would be approximately 10 to 15 trips per day during the drilling and completion of the well (personal communication with Cale Gee, Reagan Smith Energy Solutions, Inc.). The use of the temporary water line to supply water for the project would eliminate the pollutant emissions by trucks that would deliver water.

Emissions can occur from a variety of processes and points throughout the oil and natural gas sector. Primarily, these emissions are organic compounds such as methane, ethane, volatile organic compounds (VOCs) and organic hazardous air pollutants (HAPs). Sources include internal combustion engines that power compressors.

All oil and natural gas wells must be “completed” after initial drilling in preparation for production. Well completion activities include multiple steps after the well borehole has reached the target depth. Flowback emissions are short-term in nature and occur as a specific event during completion of a new well or during recompletion activities that involve re-drilling or re-fracturing an existing well. The flowback stage of a well completion is highly variable but typically lasts between 3 and 10 days for the average well (EPA 2011). Stephens Production Company routes all methane captured during the flowback and completion process to a completion combustion device as required by EPA’s 40 CFR Part 60, subpart OOOO emission standards. The flame produced as a result of the completion combustion is expected to burn clear and produce no smoke. Depending upon the equipment used the flame may only be visible on site or may be visible up to one mile away (personal communication with Sam Hall, Drilling Engineer, Stephens Production Company). The flame may be visible from Cameron Bluff depending upon the type of equipment used.

Table 4. Displays the potential emissions vented into the atmosphere by well completion type category (EPA 2011).

Table 4 Potential Emissions by Well Completion Category^a

Well Completion Category	Emission (tons/event)		
	Methane	VOC	HAP
Natural Gas Well Completion without Hydraulic Fracturing	0.8038	0.12	0.009
Natural Gas Well Completion with Hydraulic Fracturing	158.55	23.13	1.68

^a. Taken from Table 4-2 EPA-454/R-11-002.

Completion combustion is a high-temperature oxidation process used to burn combustible components, mostly hydrocarbons, found in waste streams. The efficiency of completion combustion devices, or exploration and production flares, can be expected to achieve 95 percent, on average, over the duration of the completion or recompletion. Table 5. displays the potential emission reduction by combustion for each well completion category (EPA 2011).

Table 5 Potential Emission Reduction by Combustion^a

Well Completion Category	Emission Reduction (tons/event)		
	Methane	VOC	HAP
Natural Gas Well Completion without Hydraulic Fracturing	0.76	0.11	0.0081
Natural Gas Well Completion with Hydraulic Fracturing	150.6	21.9	1.597

^a. Taken from Table 4-6 EPA-454/R-11-002.

Noise and heat are the primary secondary outcomes of completion combustion device operation. In addition, combustion and partial combustion of many pollutants also create secondary pollutants including nitrogen oxides (NO_x), carbon monoxide (CO), sulfur oxides (SO_x), carbon dioxide (CO₂), and smoke particulates (PM). Table 6. displays the net emissions after the flowback gasses are combusted in the completion combustion device.

Table 6 Net Emissions after Completion Combustion^a

Well Completion Category	Emission Reduction (tons/event)		
	Methane	VOC	HAP
Natural Gas Well Completion without Hydraulic Fracturing	0.0438	0.01	0.0009
Natural Gas Well Completion with Hydraulic Fracturing	7.95	1.23	0.083

^a. Calculated using Table 4-2 and Table 4-6 EPA-454/R-11-002.

Table 6. displays the secondary emissions produced by combusting the flowback gasses in the completion combustion device for wells with hydraulic fracturing.

Table 7 Potential Secondary Emissions after Completion Combustion with Hydraulic Fracturing^a

Pollutant	Emissions tons/event ^{bc}
Total Hydrocarbon	0.66
Carbon Monoxide	1.76
Nitrogen Oxides	0.32
Particulate Matter	0.011
Carbon Dioxide	628

^a. Taken from Table 4-9 EPA-454/R-11-002

^b. Assumes 8,716 Mcf of natural gas is sent to the combustion unit per completion.

^c. Based on 1,089.3 Btu/scf saturated gross heating value of the “raw” natural gas.

Potential Emissions from well completion for the proposed well are expected to be within the range of those for wells completed without hydraulic fracturing and those completed with hydraulic fracturing after reduction by the completion combustion device (see Table 6.). Potential secondary emissions due to completion combustion of the flowback gasses are expected to be within the range of those with hydraulic fracturing (see Table 7.).

No activities would result in violations of federal air quality standards. During project implementation, fugitive dust would likely arise from travel on roadways and from well site and production facilities construction.

Following the construction activities, emissions of fugitive dust are expected to be negligible due to infrequent vehicle traffic necessary to conduct pipeline inspections and customary vehicular traffic through the project area.

Cumulative Effects

No cumulative effects to air quality are expected to occur. There are seven other natural gas wells proposed for the analysis area, but the effects to air quality are not expected to overlap with the effects to air quality from the proposed Stephens gas well. There are 41 existing and seven proposed natural gas wells in the Short Mountain Creek Watershed and 2,680 total natural gas wells in Logan County. The county is currently meeting the NAAQS with 41 producing natural gas wells in the Short Mountain Creek Watershed and 2,680 producing natural gas wells total in Logan County, so the addition of this well is not expected to cause the county to exceed the NAAQS.

Alternative 2

There would be no emissions or dust created from construction vehicles and equipment. The greatest impact to air quality, albeit minimal, would be from customary vehicular traffic through the project area.

Cumulative Effects

No cumulative effects to air quality are expected because the proposed project would not be implemented.

D. CLIMATE CHANGE

Existing Condition

Research and analysis of evidence dating many years ago show intervals of warming and cooling on earth. The current warming trend is particularly important because it is proceeding at an unusual rate. Assessments by the Intergovernmental Panel on Climate Change (IPCC) suggest that the Earth's climate has warmed between 0.6 and 0.9 degree Celsius over the past century and that human activity affecting the atmosphere is "very likely" an important driving factor. (U.S. Department of Energy, Energy Information Administration; 2008).

The following information is from the National Climatic Data Center's website (National Climatic Data Center, 2011): Many chemical compounds present in Earth's atmosphere behave as greenhouse gases. These are gases, which allow direct sunlight (relative shortwave energy) to reach the Earth's surface unimpeded. As the shortwave energy (that in the visible and ultraviolet portion of the spectra) heats the surface, longer-wave energy (heat) is reflected to the atmosphere. Greenhouse gases absorb this energy, thereby allowing less heat to escape back to space, and 'trapping' it in the lower atmosphere. Many greenhouse gases occur naturally in the atmosphere, such as carbon dioxide, methane, water vapor, and, nitrous oxide, while others are synthetic. Those that are man-made include the chlorofluorocarbons, hydrofluorocarbons and perfluorocarbons, as well as sulfur hexafluoride. Atmospheric concentrations of both the natural and man-made gases have been rising over the last few centuries. As global population increases and reliance on fossil fuels (such as coal, oil and natural gas) is firmly solidified, emissions of these gases continue to rise. While gases such as carbon dioxide occur naturally in the atmosphere, through our interference with the carbon cycle, we artificially move carbon from solid storage to its gaseous state, thereby increasing atmospheric concentrations (National Climatic Data Center, 2011).

The principal greenhouse gases that enter the atmosphere because of human activities are carbon dioxide, methane, nitrous oxide, and fluorinated gases (U.S. Environmental Protection Agency, 2011d). Atmospheric carbon dioxide concentration is now higher than at any time in the past 10 million years (Kennedy and Hanson, 2006). Humankind has altered the natural carbon cycle by burning coal, oil, natural gas and wood and since the industrial revolution began in the mid 1700s, each of these activities

has increased in scale and distribution. Prior to the industrial revolution, concentrations were fairly stable at 280 parts per million (ppm). Today, they are around 370 ppm, an increase of well over 30 percent (National Climatic Data Center, 2011). In 2006, carbon dioxide emissions from the United States accounted for about 20 percent of the amount added to the atmosphere globally. Fuel combustion accounted for 94.0 percent of U.S. carbon dioxide emissions in 2007; this figure represents approximately 85.4 percent of the nation's total greenhouse gas emissions that year. Changes in land use and forestry practices can also emit carbon dioxide through conversion of forest land to agricultural or urban use or can act as a sink for carbon dioxide (U.S. Environmental Protection Agency, 2011d).

Numerous processes collectively known as the "carbon cycle" naturally regulate concentrations of carbon dioxide in the atmosphere. Natural processes, such as plant photosynthesis, dominate the movement ("flux") of carbon between the atmosphere and the land and oceans. Carbon sequestration is the process by which atmospheric carbon dioxide is taken up by trees, grasses, and other plants through photosynthesis and stored as carbon in biomass (trunks, branches, foliage and roots) and soils. The sink of carbon sequestration in forests and wood products helps to offset sources of carbon dioxide to the atmosphere, such as deforestation, forest fires and fossil fuel emissions. Carbon accumulation in forests and soils, however, eventually reaches a saturation point, beyond which additional sequestration is no longer possible. This happens, for example, when trees reach maturity, or when the organic matter in soils builds back up to original levels before losses occurred (U.S. Environmental Protection Agency, 2011d). While natural processes can absorb some of the net 6.2 billion metric tons (7.2 billion metric tons less 1 billion metric tons of sinks) of anthropogenic (human-caused) carbon dioxide emissions produced each year (measured in carbon equivalent terms), an estimated 4.1 billion metric tons are added to the atmosphere annually. This positive imbalance between greenhouse gas emissions and absorption results in the continuing increase in atmospheric concentrations of greenhouse gases. (U.S. Department of Energy, Energy Information Administration; 2008).

In computer-based models, rising concentrations of greenhouse gases produce an increase in the average surface temperature of the Earth over time. Rising temperatures may, in turn, produce changes in precipitation patterns, storm severity, and sea level commonly referred to as "climate change" (U.S. Department of Energy, Energy Information Administration; 2008). Projected climate change impacts include air temperature increases, sea level rise, changes in timing, location and quantity of precipitation and increased frequency of extreme weather events such as heat waves, droughts, and floods. These changes would vary regionally and affect renewable resources, aquatic and terrestrial ecosystems, and agriculture. Changes in temperature and precipitation would alter the growth patterns and distribution of plant and animal species. There are uncertainties regarding the timing and extent magnitude of climate change impacts, but continued increases in human greenhouse gas emissions would likely lead to increased climate change.

Effects

Alternative 1

Forests and soils have a large influence on atmospheric levels of carbon dioxide. The carbon stored in live biomass, dead plant material and soil represents the balance between carbon dioxide absorbed from the atmosphere and its release through plant respiration as well as decomposition and burning.

With this alternative, some of the carbon currently sequestered in vegetation and soils would be released back to the atmosphere. In the short-term, greenhouse gas emissions and alteration to the carbon cycle would be caused by harvest of timber for well pad and access road construction and by well drilling and completion activities. Harvest would remove some of the mature stems with diminished ability to sequester additional carbon; some of the carbon sequestered in harvested stems would continue to be stored in manufactured wood products. Residual stems adjacent to the proposed project area would continue to sequester and store carbon. Although naturally occurring methane is typically encountered during drilling operations, it is not anticipated to be produced at levels high enough to affect climate

change. Stephens Production Company routes all methane captured during the flowback and completion process to a completion combustion device as required by EPA's 40 CFR Part 60, subpart OOOO emission standards.

As greenhouse gas emissions are integrated across the global atmosphere, it is not currently possible to ascertain the degree of indirect effects or cumulative impacts this project would have on a global climate. The nominal reduction in carbon sequestration and the nominal increase in methane release along with other potential pollutants would not result in quantifiable impacts.

Alternative 2

It is currently not possible to predict the actual effects of a project on global climate change, so a baseline comparison cannot be made using the no action alternative relative to climate change.

No activities would take place so no green house gasses would be added to the atmosphere due to the project.

E. VISUAL QUALITY

Existing Condition

The analysis area for visual quality is the area viewable from Green Bench Road and Cameron Bluff Scenic Drive located on the northwestern rim of Mt. Magazine State Park, which is an area of about 1800 acres. This area is a rural area that is mostly forested land. The predominate tree species is shortleaf pine, eastern red cedar, and hardwood.

Visual quality is defined as the degree of acceptable alteration to the characteristic landscape. The project area has a Visual Quality Objective (VQO) of Retention with a Scenic Integrity Objective (SIO) of High as listed in the LRMP (p. G-4). Scenic integrity in the High category (Appears unaltered-Retention) refers to landscapes where the valued landscape character "appears" intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so completely and at such scale that they are not evident.

Effects

Alternative 1

Visual impacts from road reconstruction, gathering line construction and access road construction activities would be visible along Green Bench Road and from the northwestern rim of Mt. Magazine State Park (Cameron Bluff Scenic Drive) for six months to one year. The pad would not be visible from Cameron Bluff Scenic Drive or Green Bench Road. A Visual Quality Analysis (VQA) indicates that portions of the access road construction and gathering line construction would be visible from both Green Bench Road and Cameron Bluff Scenic Drive (see Figure 5 below). This would fade within six months to one year as the area is reseeded and vegetation reclaims the road right-of-ways. A paint color that allows facilities to blend in with the natural landscape would be required for well site production equipment and appurtenances. This will enable the facilities to blend in when seen from a viewing distance and location typically used by the public. The paint color would be specified by the Forest service.

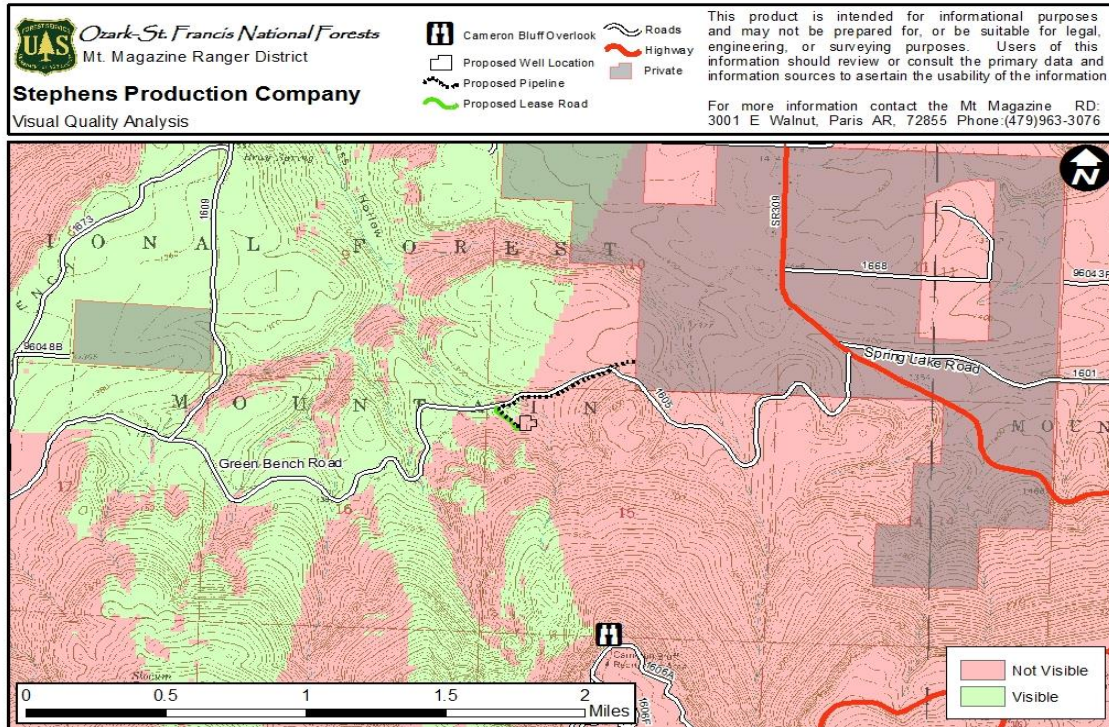


Figure 5 Viewshed from Cameron Bluff Overlook

The 647 feet of new road construction into USA #1-15H would be designed to meander into the pad location following natural contours. USA #1-15H would not be clearly visible from Greenbench Road. Impacts would include presence of the drilling equipment and viewing the cleared area. The drilling equipment would be on the site for approximately 45 days and the cleared area would be less visible within six months to one year. If the well is a producer, long-term impacts may include the presence of production equipment for up to 30 years or more. If any facilities are required on the drill pad site after drilling is complete, a paint color that allows facilities to blend in with the natural landscape background would be required (Mitigation Measure #2).

The proposed activities are located approximately one-half mile to one mile from the Mt. Magazine Hiking Trail. Users of the Mt. Magazine Hiking Trail are not expected to be able to view any of the proposed actions in this alternative, with the possible exception of the flame produced by burning the gas in the flowback during well completion, due to distance, topography, and vegetation. Stephens Production Company routes all methane captured during the flowback and the completion process to a completion combustion device as required by EPA's 40 CFR Part 60, subpart OOOO emission standards. The flame produced as a result of the completion combustion is expected to burn clear and produce no smoke. Depending upon the equipment used the flame may only be visible on site or may be visible up to one mile away. The flame may be visible from Cameron Bluff Scenic Drive depending on the type of equipment used for completion combustion.

Cumulative Effects

No cumulative effects are expected because no past, present, or future activities are expected to overlap with the proposed activity. The nearest existing gas well to the proposed gas well site is approximately 1.08 miles to the northeast and the nearest gas well that is proposed for drilling is approximately 1.5 from the well proposed in this project.

Alternative 2

Visual quality impacts would be limited to those caused by on-going forest management activities. At this time there are no other specific reasonably for seeable forest management actions planned within the area of effects.

F RECREATION

Existing Condition

Green Bench Road, the western half of Cameron Bluff Scenic Drive and the portion of the Mt. Magazine Hiking Trail from the trailhead on Green Bench Road to the top of Mount Magazine serve as the analysis area for recreation, which is an area of about 300 acres.

Green Bench Road is used by hunters and local residents for access to the eastern end of the district. It is part of the designated Off-Highway Vehicle (OHV) route. The Mt. Magazine Hiking Trail crosses Green Bench Road approximately one-half mile east of the USA #1-15H gas well location.

Hunting for whitetail deer and eastern wild turkey is a popular recreational activity in this area. Hunting of squirrel and limited hunting of quail also occurs.

Additional recreation activities within the analysis area include driving for pleasure, berry picking, and firewood gathering.

The Recreation Opportunity Spectrum (ROS) provides a framework for defining classes of outdoor recreation opportunity environments (U.S.D.A. FS 1986). There are six ROS designations ranging from primitive to urban classifications. The analysis area contains two of these designations – Roaded Natural (RN) and Rural(R). Roaded natural settings are located within a half mile of a road and usually provide higher levels of development such as campgrounds, picnic area, and river access points. Rural settings represent the most developed sites and modified natural settings on the forest. Examples of this classification are motorized and non-motorized recreation, such as driving for pleasure, viewing scenery, picnicking, and fishing.

Alternative 1

Proposed activities would temporarily increase traffic on Green Bench Road. Mitigation Measure # 24 requires Stephens Production Company to post signs to warn road users of traffic and activities in the area. Users of these roads may be inconvenienced during implementation of the proposed activities.

Hikers and hunters in the area may be distracted by noise from construction and drilling activities associated with USA #1-15H development. This would be for a period of about 45 days until well drilling activities are completed.

Machinery or other noise associated with the well location that has the potential to disturb the recreating public would be controlled to reduce sound levels. Suitable mufflers would be installed on all internal combustion engines and certain compressor components. Engineered sound barriers or sound-insulated buildings may be required to meet Federal Energy Regulatory Commission (FERC) noise standards.

The noises from gas well construction, road activities, and drilling operations would be a short-term impact. Gas well construction and road activities could take approximately 1-3 months, depending upon weather conditions. Drilling activities are expected to last from 10 to 45 days.

Although equipment would have mufflers installed (Mitigation Measure #1), the noise from the engine or

motor operating a pumping unit during production would be a longer-term impact. Engineered sound barriers or sound-insulated buildings may be required to meet the FERC noise standards.

Cumulative Effects

No cumulative impacts to recreation are expected to occur. There are no past, present, or future projects identified that would combine to affect recreation. This is because activities at existing natural gas wells have been greatly reduced because they are producing and the nearest well is approximately 1.08 miles away from the proposed well. Existing natural gas well pads have been partially restored and reduced to the area necessary to service the well. The existing wells are occasionally visited by maintenance personnel. The other natural gas wells proposed in the area are not expected to be installed during the time that this proposed well is being installed.

Alternative 2

Recreation impacts would be limited to those caused by on-going forest management activities. At this time there are no other specific reasonably for seeable forest management actions planned within the area of effects.

G. CULTURAL RESOURCES

Existing Condition

Known Cultural Resources.

The Mt. Magazine Ranger District in its entirety has been inventoried for cultural resources. Fieldwork, reporting, and consultation with the Arkansas State Historic Preservation Office and relevant federally recognized Tribes were completed in 2008 and 2009 (Mt. Magazine Assessment 08-10-06-01 and Addendum 09-10-06-01).

The completion of inventory for the District enables projects to be planned to avoid impacts to known cultural resources. Under the provisions of the 2006 Programmatic Agreement (PA) between the Ozark-St. Francis National Forests, the Arkansas State Historic Preservation Office (SHPO), and the relevant federally recognized Tribes, proposed projects located in areas that have been previously surveyed and where no cultural resources would be disturbed or impacted may be documented internally as Heritage Categorical Exclusions. A resurvey of the area is not required by the PA or by the National Historic Preservation Act. However, in areas with higher probabilities of containing sites, additional testing may be conducted during the planning phase to ensure that no additional sites would be impacted. This fieldwork is conducted under the supervision of the District or Forest Archeologist and pursuant to the work standards established in the PA.

There are no known sites recorded within this project's area of potential effects. Accordingly, the cultural resource review for this project has been documented internally as a heritage categorical exclusion (13-10-06-13).

Should any new sites or cultural materials be discovered during project implementation, work would cease and the appropriate mitigation measures would be prescribed by the District or Forest Archeologist in consultation with the Arkansas SHPO and our Tribal partners.

Effects

The scope of the analysis for potential effects to cultural resources includes the entire project area and considers the proposed activities within the project area as well as access to these areas. There are no known cultural resources located within this project's area of potential effects. The nearest recorded archeological site is located approximately ¼ mile outside of this project area, and it should not be impacted by any activities associated with this project.

Alternative 1

None. There are no known cultural resources located within the project's area of potential effects. Should any new sites or cultural materials be discovered during project implementation, work would cease and the appropriate mitigation measures would be prescribed by the District or Forest Archeologist in consultation with the Arkansas SHPO and our Tribal partners.

Cumulative Effects

No cumulative effects to cultural resources are expected to occur. This is because potential impacts to cultural resources would be limited to the immediate well pad and road construction activities. In addition, there are no other past, present, or future projects identified that would combine to affect cultural resources.

Alternative 2

This alternative would have no effect on heritage resources.

Cumulative Effects

None.

H. VEGETATION

Existing Condition

The analysis area for vegetation is the area disturbed by the proposed activities.

Vegetation in the project area is comprised primarily of shortleaf pine with scattered hardwoods. Midstory tree species include species such as oak, hickory, dogwood, persimmon, and red cedar. Common shrubs and vines along with grasses and other herbaceous vegetation are found in the understory.

Effects

Alternative 1

The area of the drill pad would be converted from a forested area to a cleared area (not to exceed 3.88 acres).

Access road construction would change approximately 0.45 acres of a shortleaf pine forest condition to an open condition with grasses in the road right-of-way.

Gathering line construction would be done along road right-of-ways that are receiving road work as described above and along Green Bench Road (1.60 acres). This area would become an open, grassy area after activities are completed. The construction would increase the amount of sunlight along Green Bench Road, which would reduce the amount of road maintenance by causing the road to dry out more quickly after rainfall.

If this well is a dry hole or at the time of well abandonment, this drill pad would be revegetated according to Forest Service specifications.

Road decommissioning of approximately 0.45 miles of road would restore this roadway back to a more natural state. Vegetation would reclaim this corridor over time.

Cumulative Effects

No cumulative effects to vegetation are expected to occur. This is because potential impacts to vegetation would be limited to the immediate well pad, road construction, and gathering line construction activities. In addition, there are no other past, present, or future projects identified that would combine to affect vegetation.

Alternative 2

Vegetation impacts would be limited to those caused by on-going forest management activities. At this time there are no other specific reasonably foreseeable forest management actions planned within the area of effects.

Cumulative Effects

None.

I. WILDLIFE

Existing Condition

The analysis area for wildlife is the area covered by the construction of drill pads and reserve pits, gathering line construction, and road activities. In this area, the diversity of wildlife species is typical for managed forestlands in the mountainous region of northwest Arkansas. Populations of white-tailed deer, turkey, and bear as well as small game are considered average for this part of the state.

There are no riparian areas located within the analysis area.

The Ozark National Forest selected Management Indicator Species (MIS), representing a wide range of habitat requirements, as evaluation tools of the effects of different vegetation and wildlife management options proposed in the project (Ozark-St. Francis FEIS p. 3-147).

MIS are planning and monitoring tools that reflect a way to analyze a change in conditions. Game species are selected based on their recreational and/or economic value and are considered a demand species. Ecological species represent a particular element(s) of biological diversity and serve as a representative of that element(s). The list below shows how the 17 chosen for the Forest fit into those categories:

Demand Species:

White-tailed deer, Eastern wild turkey, Black Bear, Largemouth Bass, and Smallmouth Bass.

Ecological Indicators:

Rufous -crowned Sparrow, Pileated Woodpecker, Scarlet Tanager, Acadian Flycatcher, Prairie Warbler, Yellow-breasted Chat, Cerulean Warbler, Northern Parula, Northern Bobwhite, Red-headed Woodpecker, Brown-headed Nuthatch, and Ovenbird.

From the Forest list, six species have potential habitat based on occurrence records and/or habitat requirements within the project area and would be addressed. These species are shown in Table 6. The remaining 11 species not being addressed can be found in Appendix B.

Table 6. Management Indicator Species Considered in this Analysis.

Black Bear (*Ursus americanus*) – the preferred habitat for black bear are areas that are relatively isolated from disturbance and are composed of mature hardwood, hardwood-pine, and pine-hardwood forest types that provide hard mast with 0-5 year old regeneration areas and food plots intermixed. Regeneration areas provide cover and food plots provide forage and soft mast.

White-tailed Deer (*Odocoileus virginianus*) - For the Forest, the preferred habitat for deer can be described as areas of mature hardwood, hardwood-pine and pine-hardwood stands, which provide hard and soft mast, with 0-5 year old regeneration areas, food plots and permanent water sources intermixed. The regeneration areas provide cover and both the regeneration areas and food plots provide browse.

Acadian Flycatcher (*Empidonax vireescens*) - To help indicate effects of management on mature mesic hardwood communities on both forests.

Eastern Wild Turkey (*Meleagris gallopavo*) - To help indicate management effects on meeting hunting demand for this species.

Pileated Woodpecker (*Dryocopus pileatus*) – For the Forest, the preferred habitat for the pileated woodpecker can be described as mature stands on any species or species mix with large dead snags and down woody debris on the forest floor.

Scarlet Tanager (*Piranga olivacea*) – is representative of species that require mature interior forest habitat. “Interior forest” is descriptive of extensive forest tracts with little land in other uses such as agriculture or urban development.

Effects

Alternative 1

Short-term ground disturbance impacts would result from direct disruption of soils and vegetation, as well as from the presence of humans and vehicles in the construction areas. Most wildlife occupying the project area would be displaced during construction activities, but some species such as nesting birds and amphibians would be vulnerable to mortality from the physical disruption of soils and vegetation. These short-term ground disturbance impacts would result in a temporary loss of habitat on approximately 3.88 acres for the drill pad and reserve pits. As stated in the Forest Wide Conditions of Approval, the operator would enclose the reserve pit with “page” (net) wire fencing, or a similar type of fencing approved by the Surface Management Agency (SMA), immediately following construction of the pit. Fencing would be retained around the pit until closure of the pit is started.

Disturbed areas created by gathering line construction and disturbed areas along road right-of-ways would be re-vegetated and allowed to return to the previous grassy condition providing habitat and food sources for small mammals, insects, and reptiles. Deer, turkey, and quail would also benefit from this re-established grassy condition.

A loss of habitat would occur on approximately 3.88 acres for drill pad and reserve pit construction. This acreage would be reduced if any portion of the drill pad is not used for production or if drilling results in a dry hole. The cleared area would then be reclaimed as specified by the Forest Service to a condition beneficial to wildlife.

Other short-term impacts to wildlife species could result from disturbance during periodic maintenance activities; however, these activities occur infrequently and only if the well is a producing well.

No long-term impacts are expected as a result of the proposed project.

For the early seral MIS at the analysis area scale, this action alternative would not contribute towards any measurable cumulative effects.

The conditions for the rest of the MIS (mast, late seral, aquatic, vegetative) would not be changed to any sizeable degree from any planned activities so this alternative would not contribute towards any measurable cumulative effects on those MIS.

At the Forest wide scale, the implementation of this project is not expected to reduce viability of MIS. Viability populations of MIS were expected to be attained with the implementation of the LRMP (LRMP FEIS, p. 3-146).

Alternative 2 (No Action)

Under the no-action alternative, the proposed activities would not be implemented. There would be no alteration to the lands or wildlife habitat; therefore, no additional impacts to wildlife resources would occur.

J. FISHERIES

Existing Condition

The analysis area for fisheries is the headwaters that drain into Gutter Rock Creek. The closest stream to the proposed activities is a defined ephemeral drain to the east of the proposed well pad approximately 150 feet that drains into Gutter Rock Creek. Gutter Rock Creek converges with Short Mountain Creek, before emptying into the Paris City Lake, and is considered a perennial stream.

Stream habitat in Gutter Rock Creek is characterized by gravel, cobble, and bedrock substrates. The pool to riffle ratio is 57%pool: 43% riffle. In-stream fish cover consists of scattered boulders and ledges with woody debris large enough to serve as cover. Fish sampling in 2007 produced five species in Gutter Rock Creek. These species were central stoneroller, creek chub, slender madtom, redbelly darter, and other *Etheostoma* spp.

The Ozark National Forest selected Management Indicator Species (MIS), representing a wide range of habitat requirements, as evaluation tools of the effect of different vegetation and wildlife management options proposed in the project alternatives (Ozark-St. Francis FEIS p. 3-147). Smallmouth bass and largemouth bass are both MIS. Largemouth bass has the potential habitat based on occurrence records and/or habitat requirements within the project area and would be addressed.

Effects

Alternative 1

Streams are dynamic systems and are in a continuous state of change. Natural sedimentation would continue to occur from bank erosion and heavy rain events.

The aquatic Management Indicator Species that were selected for the Ozark-St. Francis National Forests are intolerant of silt and degraded habitat conditions and are indicative of excellent water quality (Robison and Buchanan, 1984). Data collected from Gutter Rock Creek would suggest that water quality has remained good in the project area. Past management, activities have included timber harvesting, silvicultural treatments, road construction and reconstruction, wildlife habitat improvement, and prescribed burning. National Forest management on these drainages has been ongoing since the early 1940s and

water quality problems have not been noted.

Based on the analysis in the Soil and Water effects sections, along with the incorporation of the mitigation measures in the proposed action; there would be no substantial effect on Gutter Rock Creek.

There may be minimal (below detection limits) increases in water yields. Since the majority of the streams in the analysis area are defined channels, any increase in water yield would provide at the most, very limited benefits to fish populations. Increased water yields, particularly during the summer and fall, could benefit the fish populations in these streams by providing more through-gravel flow, increased nutrients, and more available aquatic habitat. However, since any increases are expected to be below detectable limits and short lived, there would not be any observable benefit to the fish population in the effected streams. Similarly, since any increases in yield would be below detectable limits, there would not be any adverse effect from increased flow, such as increases in stream bank erosion or scouring.

The effects of the proposed action, both individually and cumulatively, are not expected to have any effects on the water quality of Gutter Rock Creek. Water quality, determined by habitat requirements of fish species collected, is considered fair in this stream. Additionally, there would be no cumulative effects on aquatic MIS from any known other projects within the project area.

Alternative 2 (No Action)

No activities are planned or implemented with this alternative; therefore, no change would occur in stream conditions that would be attributable to management actions proposed here. Streams are dynamic systems and are in a continuous state of change. Natural sedimentation would continue to occur from bank erosion, from existing roads and trails, as well as heavy rain events.

Because no activities are planned with this alternative, aquatic MIS species would not be affected.

K. PROPOSED, ENDANGERED, THREATENED AND SENSITIVE SPECIES

Existing Condition

The analysis area for proposed, endangered, threatened, and sensitive species is acres that would be disturbed by implementing this alternative.

A Biological Evaluation (BE) has been completed for all alternatives and is in the project file. Sources of information included the U.S. Fish and Wildlife Service, Forest Service Region 8 PETS list, Arkansas Natural Heritage Commission database, district field survey reports, state universities, the Arkansas Game and Fish Commission, and numerous reference documents.

All species listed on the Regional Forester's Sensitive species list (2001) as well as all current Federal listed species for Arkansas (July 7, 2001) were considered for this evaluation. A complete list of species and how they were addressed is contained in the BE.

No critical habitat for any PET species has been identified within the analysis area. For a complete list and description of each species needs and habitat conditions, reference the BE found in the process file for this project.

Effects

Alternative 1

There would be no effect on the Ozark big-eared bat or the Gray bat beyond those disclosed in a

Programmatic Biological Evaluation dated 10-28-97, with concurrence by the U.S. Fish and Wildlife Service dated 11-24-97 (project file).

There would be no effect to Indiana Bat, beyond those disclosed in the Biological Opinion for the Land and Resource Management Plan rendered by the U.S. Fish and Wildlife Service dated 6-25-98 and the amendment to the opinion dated March 21, 2002. Copies of the Biological Opinion and the Biological Opinion amendment are in the project file.

American Burying Beetles are known to occur near the project area, however; open understory conditions do not currently exist in the proposed project area. Negative direct impacts to individuals of this species could possibly result from implementation of this project, but with implementation of Forest-wide standards from the Revised LRMP and the Final American Burying Beetle Conservation Plan, and adherence to direction provided by the USFWS during the revision, the project should have no negative direct, indirect, or cumulative effects to the species as a whole. The project is not likely to adversely affect the American Burying Beetle with implementation of the proposed action.

Ozark Chinquapin has not been limited by gas exploration practices, but rather the spread of the chestnut blight. Any actions taken to promote the increase of the Ozark Chinquapin would be ineffective as the blight is widespread.

There would be no impact on any other Sensitive species analyzed in this document.

There are no cumulative impacts associated with the proposed treatments on any PETS either in or near the analysis area because impacts from the project are localized. The project area is less than 4 acres and no known projects within the general area are planned.

Alternative 2 (No Action)

Under the No Action alternative, conditions would generally remain the same. No threatened, endangered, or rare species would be impacted. No habitat would be altered or removed.

L. TRANSPORTATION

Existing Condition

Forest Development Road (FDR) 1605 (Green Bench Rd) is currently open for public use. FDR 1605 is in overall good condition, receives annual maintenance, and was designed to accommodate large vehicles such as semi-trucks and trailers. There are several concrete slab type creek crossings on the section of road between State Hwy 309 and the proposed location for the USA #1-15H (ARES 54692). One of these crossings currently has a small failure causing the concrete to break apart.

Effects

Alternative 1

Stephens Production Company would be required to obtain a Special Use Permit from the Forest Service to conduct commercial operations on all Forest Service jurisdiction roads that are needed for operations. FDR 1605 and the access road connecting FDR 1605 and USA #1-15H location both would require a permit. Although the small concrete failure identified above in the existing conditions currently poses no hazard. There is a high potential for slab failure once activity associated with the USA #1-15H begins. If the slab failed, crossing it would become increasingly hazardous. Stephens Production Company would be required to repair the slab failure prior to drilling operations. In addition, Stephens Production Company would be responsible for the maintenance of all roads listed in the Special Use Permit. This

maintenance would include blading, spot placement of aggregate, cleaning ditches and cutting back encroaching brush from the roads right-of-way.

Alternative 2 (No Action)

Transportation impacts would be limited to those caused by on-going forest management activities. At this time there are no other specific reasonably foreseeable forest management actions planned within the area of effects.

M. HUMAN HEALTH FACTORS

Existing Conditions

The analysis area for human health factors is the project area.

There are negligible risks to human health from the use of herbicides or cutting tools in the project area. Dead and dying trees along traveled roadways and in camping/hunting areas in the analysis area may give pause for concern for forest workers and visitors. Falling trees and limbs can cause personal injury and damage personal property. Accumulations of forest litter in the analysis area create a potential for wildfires.

Alternative 1

There would be a limited number of potential impacts to human health and safety. These risks include the physical risks associated with general construction practices, heavy equipment, or other associated hazards.

Dust emissions associated with the proposed actions is discussed under Air Quality. Noise impacts are discussed under Recreation.

Implementation of Mitigation Measures #10 and #11 would insure sanitary conditions are being met at the drill sites.

The APD contains a Spill Prevention Control and Countermeasure Plan that would be followed in the event of a spill. This plan is found in Appendix E of the APD. This plan also includes procedures for routine inspections to report any leaks, oil or water accumulations, etc.

The Proposed Action would include the use of chemical and non-chemical treatments of vegetation. Herbicides kill the existing plant but often allow remaining seeds to germinate. Herbicides are known through experience with similar activities to be one of the most effective treatment methods for eradicating or controlling weed species (For the purpose of this document weed species consists of vegetation that may be outside of management desired objective such as non-native invasive species or aggressive native species that are found in the Southern Regional Forester's List and Ranking of Invasive Exotic Plant Species of Management Concern in Appendix D.). When herbicides are used in conjunction with an integrated treatment effort, it improves the effectiveness of non-chemical treatments, either concurrently or as follow-up treatments.

The herbicide proposed for use within the Project Area has glyphosate as its active ingredient. Because the herbicide proposed for use does not persist in the soil at effective levels for more than a few months (at the maximum), follow-up treatments may be needed to eliminate new sprouts that were in seed during the initial treatment. The most noticeable consequences from weed treatment would be the beneficial improvements to native ground vegetation such as grasses, forbs and shrubs that would last for 3 to 5 years or more.

Glyphosate formulas/products that have been registered with the Environmental Protection Agency (EPA) for rangeland, forestland, or aquatic use would be applied. In addition, the Forest Service has completed a risk assessment for glyphosate that has analyzed the risk of glyphosate on human health and safety, on wildlife/fish, and on non-target plants. The web site address is:
<http://www.fs.fed.us/foresthealth/pesticide/risk.shtml>

No aerial application of herbicides would be used for this project. Herbicides would be applied using ground-based methods such as hand application using gloves, or spray using a backpack containing the herbicide attached to a flexible sprayer, wand or other hand application device that directs the chemical onto the target weed. The following table explains terminology commonly used in evaluating health risk associated with herbicides.

Table 8 Herbicide Risk Assessment Standard Terminology

Term	Abbrev	Explanation (see risk assessments for specific definitions)
Toxic		The short-term effects of exposure to a chemical, which appear immediately upon exposure. See specific sections of the risk assessments for definition of the various "end points" of exposure, e.g. nervous system.
Sub-chronic		The effects that do not appear immediately, but that would appear over a short period of time after exposure, or if exposure continues for a period of time.
Chronic		Effects over a number of years (or over a lifetime) of repeated exposure
No Observed Adverse Effect Level	NOAEL	The amount of a substance that shows no toxic effects given short term (mg/kg body weight) or to show lack of chronic effects over long duration may be expressed as a dose over time (mg/kg/day).
No Observed Effect Concentration	NOEC	Used for plants to determine the lowest concentration at which a concentration of herbicide had no effect.
Safety Factor		Once a no observable effect level is established, safety factors are applied for the human risk assessments in order to set a reference dose. Safety factors depend on the information used for the no effect finding. Factors include such circumstances as uncertainties in species-to species extrapolation as well as accounting for sensitive individuals in the population. Each factor reduces the exposure dose by dividing by 10, so that a NOAEL of 5 would become an RfD of 0.05 if three safety factors were applied.
Reference Dose	RfD	The amount of a substance that would not have an adverse effect if this does were given every day over a lifespan of 70 years. It is measured in milligrams of substance per kilogram body weight of the person of concern, per day (mg/kg/day). An RfD is basically defined as a level of exposure that would not result in any adverse effects in any individual. The U.S. EPA RfDs are used because they generally provide a level of analysis, review, and resources that far exceed those that are or can be conducted in support of most Forest Service risk assessments. In addition, it is desirable for different agencies and organization within the Federal government to use concordant risk assessment values.
Hazard Quotient	HQ	The result of dividing the reference dose by the expected exposure to provide a measure of the hazard and so a relationship to the expected risk.

The information in this analysis was provided from the Syracuse Environmental Research Associates Herbicide Risk Assessment for Glyphosate.

Note: Tank mixes and adjuvants (such as Cide-Kick) may be added to the herbicide to improve effectiveness and control of target species. Herbicide would be applied at rates and use only application methods specified on the label. Additional spot treatments would be needed to reach the desired future condition in some areas.

These are standard risk assessment procedures, tested by several years of EPA use and scrutiny by the larger scientific community. As noted in the risk assessment, the anticipated effects can be minimized or avoided by prudent industrial hygiene practices during proper handling of the herbicide. Scientific evidence considered in the risk assessment requires that normal and reasonable care should be taken in the handling of this or any other chemical. Notwithstanding these reservations, the use of herbicides does not appear to pose any risk of systemic toxic effects to workers or the general public in Forest Service Programs.

Glyphosate

Description

The active ingredient herbicide *glyphosate* (examples of trade name RoundUp, RoundUp Pro, Accord SP) would typically be applied to target vegetation with a directed ground application by backpack or vehicle mounted sprayer, at manufacture's labeled rates per acre. Mixing rates would vary depending on topography and amount of vegetation to be controlled. Repetitive treatments may occur in follow up years until NNIS are eliminated or for the life of the well. Spot applications would occur in years following the initial treatments to control future growth. Spot applications would be made at the same rate and mixture or less, but would be applied only to small areas as needed, and typically made with backpack or vehicle-mounted sprayer.

Risk Summary

The risk characterization for both workers and members of the general public are reasonably consistent and unambiguous. For both groups, there is very little indication of any potential risk at the typical application rate. Even at the upper range of plausible exposures in workers, exposure is below the level of concern, even at the upper levels when broadcast spray is used. For members of the general public, none of the longer-term exposure scenarios exceed or even approach a level of concern. There is no route of exposure or exposure scenario suggesting that the general public would be at risk from longer-term exposure to *glyphosate*. Only exposure scenarios that contemplate consumption of water directly out of a pond immediately after a spill exceed the levels of concern.

The current risk assessment for *glyphosate* supports the conclusions reached by U.S. EPA: Based on the current data, it has been determined that typical application rate does not approach the level of exposure in the reference dose.

At the typical application rate, the exposure to hazardous levels would not be reached or exceeded under worst-case conditions (SERA 2011a).

Cumulative Effects

No past, present, or future activities are expected to combine to impact human health. Cumulative effects to water and air that could have an impact on human health are discussed in their respective sections above.

Alternative 2

Under this alternative, conditions would remain the same. There would be no concern for human health and safety.

N. SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Existing Condition

This project area encompasses a portion of northern Logan County, Arkansas. The total population of Logan County was estimated to be 21,983 in 2012. This is a slight decrease from the 2010 census population of 22,353.

The racial mix is mainly comprised of White (93.2%), Black or African-Americans (1.3%), and Hispanic or Latino (2.3 %). The remaining 3.2% is divided among Asians, American Indian and Alaska Natives, or some other race (United States Census Bureau 2010).

The 2010 per capita income for Logan County was \$19,464, slightly lower than the estimated per capita income for Arkansas, which was \$21,833. The 2010 median household income for Logan County was \$38,447 compared to the median household income for Arkansas of \$40,149. Approximately 15.6% of the total county population lives below poverty, slightly lower than the state rate of 18.4% (United States Census Bureau 2010).

In 2010, there were 10,116 housing units in Logan County with 5.3% being multi-unit structures. The homeownership rate in 2010 was 75.2%, which is higher than the state rate of 67.5%. The median value of owner-occupied housing units was \$80,200, which was significantly lower than the median value of owner-occupied housing units for the state (\$105,100). (United States Census Bureau 2010).

Effects

Alternative 1

Minor, short-term beneficial effects are expected under this alternative. The labor for the proposed activities would be provided by local and/or regional contractors, which may result increases in the population of the area for a period of six months to one year. Materials and other expenditures would mostly be obtained through merchants in the area, giving direct economic benefits. Road and well pad construction materials, such as aggregate and fill would be obtained locally. Cement and other construction materials would be obtained locally. Drilling pipe would be obtained from somewhere beyond the local area. There would be no disproportionate effects to minority groups resulting from this alternative. The proposed action would affect all segments of the population equally because there are no specific minority groups living in the area.

Cumulative Effects

The proposed action is expected to combine with the revenue and employment impacts from existing and future wells to increase income and employment opportunities in the local area. All segments of the population are expected to benefit equally.

Alternative 2

Conditions would generally remain the same. There would be no additional jobs brought in the area and no economic benefits would be realized. There would be no disproportionate effects to minority groups resulting from this alternative.

IV. CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals, Federal, Tribal, State, and local agencies during the development of this environmental assessment:

ID Team Members:

Mary Brennan, Zone Archeologist, Boston Mountain/Pleasant Hill/Mt. Magazine Ranger Districts, Ozark National Forest, Clarksville, Arkansas.

Mark Burge, Timber Management Assistant, Mt. Magazine Ranger District, Ozark National Forest, Paris, Arkansas.

Jason Davis, District Engineering Technician, Mt. Magazine Ranger District, Ozark National Forest, Paris, Arkansas.

Steve Duzan, Forest NEPA Coordinator, Ozark-St. Francis National Forests, Russellville, Arkansas.

Roy Estep, Minerals Technician, Pleasant Hill Ranger District, Clarksville, Arkansas.

Mindi Lawson, Wildlife Biologist/Other Resource Assistant, Mt. Magazine Ranger District, Ozark National Forest, Paris, Arkansas.

Rick Monk, Forest Hydrologist Ozark-St. Francis National Forests, Russellville, Arkansas

Charles Mosley, Minerals Technician, Ozark-St. Francis National Forests, Russellville, Arkansas

Joy Serrano, Outdoor Recreation Planner, Mt. Magazine Ranger District, Ozark National Forest, Paris, Arkansas.

Chip Stokes, Geographical Information System Specialist, Mt. Magazine Ranger District, Paris, Arkansas.

John Thias, Forester, Mt. Magazine Ranger District, Ozark National Forest, Paris, Arkansas.

Len Weeks, ID Team Leader, Forest Soil Scientist Ozark-St. Francis National Forests, Russellville, Arkansas.

Rick Williamson, Boston Mountain Magazine Ranger District Fire Management Officer, Magazine Ranger District, Paris, Arkansas.

Federal, Tribal, State, and Local Agencies:

Arkansas State Historic Preservation Office

Colby Wells, Biologist, Arkansas Game and Fish Commission, Paris, Arkansas.

Chairman Larue Martin Parker, Caddo Indian Tribe of Oklahoma, Binger, Oklahoma.

Principal Chief Chad Smith, Cherokee Nation of Oklahoma, Tahlequah, Oklahoma.

Principal Chief Gregory Pyle, Choctaw Nation of Oklahoma, Durant, Oklahoma.

Principal Chief James Gray, Osage Tribal Council, Pawhuska, Oklahoma.

Principal Chief John Berrey, Quapaw Tribe of Oklahoma, Quapaw, Oklahoma.

Governor Kenneth Blanchard, Absentee-Shawnee Tribe of Indians of Oklahoma, Shawnee, Oklahoma.

Tribal Chairman Earl J. Barbry, Sr., Tunica-Biloxi Tribe of Louisiana, Marksville, Louisiana.

Chief Charles Enyart, Eastern Shawnee Tribe of Oklahoma, Seneca, Missouri.

President Edgar French, Delaware Nation, Anadarko, Oklahoma.

John Reiss, Reservoir Geologist, U.S. Bureau of Land Management, Southeastern States Field Office, Jackson, Mississippi.

APPENDIX A PROPOSED ACTION 30-DAY COMMENT PERIOD COMMENTS AND RESPONSES.

Scoping for this project began with the mailing of the proposed action to adjacent landowners and interested citizens on April 12, 2013. This list included letters to eight Native American Tribes and the Arkansas Game and Fish Commission. The scoping package contained a description of the proposed action, a map depicting the proposed action, and a comment form. Thirty-four letters were mailed.

A legal notice requesting comments during the legal comment period was published on April 15, 2013 in the Times Record, a newspaper of daily circulation out of Fort Smith, Arkansas.

A copy of the proposed action letter was posted that same week on the Ozark-St. Francis National Forests website at <http://www.fs.usda.gov/Internet/FSEDocuments/stelprdb5416382.pdf>.

This project was also listed in the Schedule of Proposed Actions and posted on the USDA National Forests website at http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5428371.pdf

Three timely public responses were received from this scoping effort.

The Forest Service separates issues from responses into two groups: significant and non-significant issues.

No significant issues were identified.

Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence.

Comments by Ross Noland Attorney, McMath Woods Law Firm

Comment:

This well is part of a larger trend of gas development in the OSFNF which is not anticipated or addressed by the current OSFNF RLRMP or FEIS.

Response

The revised Forest Plan was developed with public input from 2001-2005. Impacts from potential minerals development on National Forests were based on the 2004 Reasonable Foreseeable Development Scenario (RFD) developed by Bureau of Land Management (BLM). Areas available for lease were determined in the Revised Plan and associated EIS. Lands available for leasing are very similar to the prior (1986) plan.

The RFD is a projection from BLM in regard to the number of wells and the associated surface disturbance that may occur over a ten year period, broken down by type of well, county, etc. In 2007, the Forest requested an updated RFD from BLM. The final version of the new RFD, that shows a date of 2008, was submitted to the Forest Service in 2009. Based on the new information in the updated RFD the Forest conducted a Changed Conditions Analysis (CCA) and Supplemental Information Report (SIR). The data from the revised 2008 RFD was analyzed by Forest specialists in the CCA and included all surface disturbance activities associated with the potential gas well drilling, such as well pads, roads and

pipelines. So far, actual gas well development on the forest has been at a slower rate than predicted in the RFD. Development has been approximately 3% of the predicted level.

The possible disturbance predicted in the updated RFD was as many as 1,730 wells impacting 10,316 acres over a ten-year period. This would equate to 1,032 acres annually. Disturbance areas would be small, generally two to seven acre disturbances, and most disturbance would be short term, lasting from several weeks to several months. The sites would be dispersed across the Forest and would occur over an extended time period. After drilling had occurred, the locations would be partially reclaimed. Based on the analyses disclosed in the CCA, the current direct, indirect, and cumulative effects of ongoing land management activities on Ozark National Forest and the additive impacts regarding the new RFD gas well development predictions are minimal and do not measurably exceed the scope of the effects previously analyzed in the Revised Forest Plan's Final Environmental Impact Statement. Based on the CCA, the SIR concluded that protections in the forest plan were adequate to address the potential increased surface disturbance and that a Forest Plan Amendment was not needed. From 2006 through 2013 forty one producing natural gas wells, five exploratory wells, and two non- producing or dry holes have been developed on the Forest which is much less than that predicted by the revised RFD. During the last two years, no natural gas wells have been developed on the Forest.

Comment:

Hydraulic fracturing utilizes millions of gallons of water, disturbs significant amounts of surface area, vents methane gas, and requires hydraulic fracturing fluids. Methane is a known potent greenhouse gas, and the full chemical contents of the fluids are not disclosed. Fluids from hydraulic fracturing operations can escape onto the surface or into groundwater, causing serious environmental damage.

Response:

This natural gas well is to be developed using nitrogen fracturing which is described in the water effects section of the EA and the environmental consequences are disclosed in Chapter III of the Environmental Assessment on pages 16-23. Nitrogen fracturing for the proposed well is expected to require approximately 10,000 barrels of water compared to 60,000 to 100,000 barrels of water required per well in the Fayetteville Shale formation. The methane gas in the flowback fluids would be routed through a completion combustion device, which would burn it.

Comment:

The Revised Land and Resource Management Plan (RLRMP) and FEIS do not study the greenhouse gas, water quantity, water quality, land use, and groundwater impacts unique to hydraulic fracturing and horizontal drilling. Failure to do so is inconsistent with the NFMA requirement to manage lands in a sustainable manner, and USFS policies such as the "Strategic Framework for Responding to Climate Change."

Response:

Greenhouse gas, water quantity, water quality, land use, and groundwater impacts unique to hydraulic fracturing and horizontal drilling are considered in the water, air quality, and climate change sections in Chapter III of the Environmental Assessment on pages 16-28.

Comment:

This well is particularly troublesome due to the fact it is in the Mt. Magazine Ranger District. According to information the Ozark Society has received from the USFS, at least thirty-five wells have become active in this district since the time the USFS finished the RLRMP and FEIS for the OSFNF. Another twenty or more wells are pending drill in this district. The RLRMP and FEIS anticipated only ten to fifteen additional wells in the entire OSFNF during the ten-year life of the plan. The level of development currently

occurring is simply not contemplated by the existing management documents. This well will require the construction of a road, a well pad, temporary waterlines, pipelines, and a production facility. All of these activities contribute to the cumulative impact of this operation. Each well permitted by the USFS has similar requirements. The USFS has not studied this well and its cumulative impacts properly. Approving this well will lead to additional impacts in the Mt. Magazine District and the OSFNF as a whole.

Response:

The revised Forest Plan was developed with public input from 2001-2005. Impacts from potential minerals development on National Forests were based on the 2004 Reasonable Foreseeable Development Scenario (RFD) developed by Bureau of Land Management (BLM). Areas available for lease were determined in the Revised Plan and associated EIS. Lands available for leasing are very similar to the prior (1986) plan.

The RFD is a projection from BLM in regard to the number of wells and the associated surface disturbance that may occur over a ten year period, broken down by type of well, county, etc. In 2007, the Forest requested an updated RFD from BLM. The final version of the new RFD, that shows a date of 2008, was submitted to the Forest Service in 2009. Based on the new information in the updated RFD the Forest conducted a Changed Conditions Analysis (CCA) and Supplemental Information Report (SIR). The data from the revised 2008 RFD was analyzed by Forest specialists in the CCA and included all surface disturbance activities associated with the potential gas well drilling, such as well pads, roads and pipelines. So far, actual gas well development on the forest has been at a slower rate than predicted in the RFD. Development has been approximately 3% of the predicted level. From 2006 through 2013 forty one producing natural gas wells, five exploratory wells, and two non- producing or dry holes have been developed on the Forest which is much less than that predicted by the revised RFD. During the last two years, no natural gas wells have been developed on the Forest.

The possible disturbance predicted in the updated RFD was as many as 1,730 wells impacting 10,316 acres over a ten-year period. This would equate to 1,032 acres annually. Disturbance areas would be small, generally two to seven acre disturbances, and short term, lasting from several weeks to several months. The sites would be dispersed across the Forest and would occur over a ten year time period. After drilling had occurred, the locations would be partially reclaimed. Based on the analyses disclosed in the CCA, the current direct, indirect, and cumulative effects of ongoing land management activities on Ozark National Forest and the additive impacts regarding the new RFD gas well development predictions are minimal and do not measurably exceed the scope of the effects previously analyzed in the Revised Forest Plan's Final Environmental Impact Statement. Based on the CCA, the SIR concluded that protections in the forest plan were adequate to address the potential increased surface disturbance and that a Forest Plan Amendment was not needed.

Comment:

NEPA requires that an agency prepare an environmental impact statement when proposing to take an action which significantly affects the environment. The term "significantly" requires consideration of both context and intensity. 40 C.F.R § 1508.27. These regulations define ten factors to be used when determining the intensity, or severity of impact. It is the Ozark Society's contention that the USFS has failed to consider these factors by declining to prepare a full environmental impact statement for gas drilling in the OSFNF.

Response:

The Environmental Analysis is being done to determine whether the environmental impacts are significant. This determination will be made in the Finding of No Significant Impact and will be based on the context and intensity factors described in 40 CFR 1508.27 as you have described. Based on the

analyses disclosed in the CCA, the current direct, indirect, and cumulative effects of ongoing land management activities on Ozark National Forest and the additive impacts regarding the new RFD gas well development predictions are minimal and do not measurably exceed the scope of the effects previously analyzed in the Revised Forest Plan's Final Environmental Impact Statement. Based on the CCA, the SIR concluded that protections in the forest plan were adequate to address the potential increased surface disturbance and that a Forest Plan Amendment was not needed.

Comment:

The degree to which the proposed action affects public health or safety. Public Health and safety concerns relating to gas drilling in the OSFNF have not been properly considered by an environmental impact statement. Such concerns include impacts on drinking water supplies, and the climate change which will result from gas flaring. A proper EIS would consider alternatives to releasing gas at the time of well finishing, such as the green completion process.

Response:

The degree to which the proposed action affects public health and safety are disclosed in the Water, Air Quality, and Human Health sections of the Environmental Assessment (EA) on pages 16-23, 23-26, and 38-40. Effects of the proposed project on climate change are disclosed in the Climate Change section of the EA on pages 26-28. The gas that is in the flowback would be routed through a completion combustion device that complies with the Environmental Protection Agency 40 CFR Part 60, subpart 0000 emission standards.

Comment:

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas. The OSFNF contains each of these unique characteristics, including wild and scenic rivers. The well that is the subject of this comment is in the Mt. Magazine Ranger District, which has bore the brunt of the impact of gas development in the OSFNF. Additionally, roadless areas exist throughout the OSFNF. The USFS has not studied the impacts gas drilling has on roadless areas.

Response:

Historic and cultural resources are considered in the Cultural Resources section of the EA on pages 31-32. There are no prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas in or near the project area. The visual impacts to the public recreating in Mount Magazine State Park are considered in the Visual effects section of the EA on pages. The environmental consequences are disclosed in Chapter III of the Environmental Assessment. There are no roadless areas near the project area.

Comment:

The degree to which the effects on the quality of the human environment are likely to be highly controversial. Gas development has become extremely controversial over the past few years, as evidenced by media reports and concerns with development on public lands such as the OSFNF. Many individuals recreate in the OSFNF. Gas development in previously protected parts of the OSFNF is controversial to these people, including the members of the Ozark Society.

Response:

The Environmental Analysis is being done to determine whether the environmental impacts are significant. This determination will be made in the Finding of No Significant Impact (FONSI) and will be

based on the context and intensity factors described in 40 CFR 1508.27 as you have described. The degree to which the effects on the quality of the human environment are likely to be highly controversial are being considered in the EA and would be considered in the FONSI.

Comment:

The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks. This well will likely use hydraulic fracturing. This technique requires fracking fluids. These fluids contain a combination of chemicals, some of which are not disclosed based on a claim that they are protected as trade secrets. Recent reports by the United States House of Representatives' Energy and Commerce Committee show that fluids often contain diesel fuel, carcinogens, and other potentially harmful ingredients. The full makeup of these fluids is unknown and dangerous.

Response:

Nitrogen fracturing is proposed in the development of this well (See chapter III of the EA on pages 13-41). Some water will be required for carrying proppants (sand) and chemicals such as scale inhibitor, acid for cleaning cement from the casing perforations, friction reducers and surfactant to increase the viscosity. No diesel will be used in the well during the fracture process of this well. Typical fracturing fluids consist of 99.51% water and 0.49% other liquids as noted above (AOGC website). The fracturing treatment will consist primarily of 70% nitrogen and 30% liquid. Nitrogen is delivered as a liquid and is warmed to a gaseous state prior to pressurized injection. The inert gas imparts energy into the formation so that more of the liquid is expelled upon release of fracturing pressure (John Reiss, BLM Reservoir Geologist, personal communication). The gas exits the formation thru the well bore as nitrogen gas, which already makes up 78% of the atmosphere. Nitrogen fracturing for the proposed well is expected to require approximately 10,000 barrels of water compared to 60,000 to 100,000 barrels of water required per well in the Fayetteville Shale formation. Chemicals used in fracturing are listed on the Arkansas Oil and Gas Commission website at http://www.aogc.state.ar.us/Well_Fracture_Companies.htm

Comment:

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts. This factor makes it clear that the significance of multiple gas leases cannot be avoided by studying the "component parts," of gas drilling in the OSFNF. Site specific studies of gas wells break down the greater impact of gas development in the OSFNF. This is particularly true in the Mt. Magazine Ranger District, which has dozens of active and proposed wells.

Response:

Cumulatively significant impacts were considered in the Chapter III. Environmental Consequences section of the EA on pages 13-41.

Comment:

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources. The OSFNF contains many sites with cultural significance. A full environmental impact statement will inform agency decisions on how to protect such resources.

Response:

The environmental effects are disclosed in Chapter III. of the EA on pages 13-41. Impacts to highways are disclosed in the transportation section of the EA. Impacts to cultural and historic resources are disclosed in the cultural resources section of the EA. There are no known cultural resources located within the project's area of potential effects. Should any new sites or cultural materials be discovered during project implementation, work would cease and the appropriate mitigation measures would be prescribed by the District or Forest Archeologist in consultation with the Arkansas SHPO and our Tribal partners.

Comment:

The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973. The OSFNF is home to dozens of protected animals, such as bats, beetles, and darters, as well as a number of protected plants. The preliminary studies that the USFS is currently conducting for gas leases in the OSFNF only consider the impacts of a single well or a small group of wells. The cumulative impacts of gas drilling in the whole forest must be considered.

Response: The impacts on endangered and threatened species are disclosed in the Proposed, Endangered, Threatened and Sensitive Species section of the Biological Evaluation (BE). Based on the new information in the updated RFD the Forest conducted a Changed Conditions Analysis (CCA) and Supplemental Information Report (SIR). The data from the revised 2008 RFD was analyzed by Forest specialists in the CCA and included all surface disturbance activities associated with the potential gas well drilling, such as well pads, roads and pipelines. So far, actual gas well development on the forest has been at a slower rate than predicted in the 2008 RFD. Development has been approximately 3% of the predicted level. . From 2006 through 2013 forty one producing natural gas wells, five exploratory wells, and two non- producing or dry holes have been developed on the Forest which is much less than that predicted by the revised RFD. During the last two years, no natural gas wells have been developed on the Forest.

The possible disturbance predicted in the updated RFD was as many as 1,730 wells impacting 10,316 acres over a ten-year period. This would equate to 1,032 acres annually. Disturbance areas would be small, generally two to seven acre disturbances, and short term, lasting from several weeks to several months. The sites would be dispersed across the Forest and would occur over a ten-year period. After drilling had occurred, the locations would be partially reclaimed. Based on the analyses disclosed in the CCA, the current direct, indirect, and cumulative effects of ongoing land management activities on Ozark National Forest and the additive impacts regarding the new RFD gas well development predictions are minimal and do not measurably exceed the scope of the effects previously analyzed in the Revised Forest Plan's Final Environmental Impact Statement. Based on the CCA, the SIR concluded that protections in the forest plan were adequate to address the potential increased surface disturbance and that a Forest Plan Amendment was not needed.

Comment:

Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. As discussed in this letter, further gas leasing and development in the OSFNF violates NFMA and NEPA.

Failing to properly study the environmental impacts of gas drilling in the OSFNF also constitutes a violation of the NFMA because there is no proper forest plan in place. Permits to use a national forest must be consistent with the management plans. 16 U.S.C. § 1604(i). If a project, such as ARES 51839, is not consistent with the applicable plan, the USFS must modify the project, reject the project, or amend

the plan to make it consistent with the project. 36 C.F.R. § 2019.8(e). The BLM and USFS have supplemented the RLRMP with a new Reasonable Foreseeable Development forecast and a Supplemental Information Report regarding gas development in the OSFNF. These documents are not accompanied by an environmental impact statement, and thus do not comply with NFMA and NEPA.

Response:

The proposed project is consistent with the Revised Forest Resource and Management Plan. The Changed Condition Analysis, the Supplemental Information Report concluded that protections in the forest plan were adequate to address the potential increased surface disturbance and that a Forest Plan Amendment was not needed. The downhole effects are considered in the EA.

Comment:

Should the USFS permit this well, it must consider the unique impact of hydraulic fracturing and place appropriate conditions on the drilling permit. Those conditions should include requirements to document water use, disclose fracturing fluid contents, create waste disposal plans, and utilize the “green completion process” to manage methane gas flares during well completion.

Response:

Nitrogen fracturing is proposed for the development of this natural gas well. The operator would be required to comply with all of the conditions Application for Permit to Drill (APD), the Surface Use Plan of Operations, the Spill Reporting Guide, and other applicable state and federal rules and regulations. Gas in the flow back during well completion would be routed through a completion combustion device as required by the Environmental Protection Agency in 40 Code of Federal Regulations Part 60 subpart OOOO. Gas in the flow back is considered in the Water and Air effects sections of the EA.

Comment:

The RLRMP and FEIS do not consider the cumulative impacts of forest-wide drilling and development in the OSFNF, or the unique impacts of hydraulic fracturing to be caused by this well. Complying with NEPA would allow the USFS to look at how increased drilling will impact the management of other resources in the forest for which it is responsible, including endangered species, roadless areas, and Wild and Scenic Rivers. The current RLRMP and FEIS are not adequate to address the cumulative impacts of hydraulic fracturing and horizontal drilling in the OSFNF, including those to be caused by ARES 50611.

Response:

The Revised Land and Resource Management Plan, the Final Environmental Impact Statement, the Changed Conditions Analysis, and the Supplemental Information Report considered the cumulative impacts of forest-wide drilling and development in the Ozark-St. Francis National Forests. The environmental consequences are disclosed in Chapter III of the EA on pages 13-41.

Comments by Shawn Porter

Comment:

In my opinion, this project should not even be on the table for consideration. The USFS / OSFNF and BLM have failed in their obligations to perform or amend outdated EIS's in advance of leasing and drilling activities that differ in scope and exceed estimates contained within the current Forest Plan approved in 2005. The SIR signed by OSFNF Supervisor Judi Henry to allow expanded drilling on the OSFNF is inadequate and circumvented public review. Granting of any APD's for drilling of new gas wells that

would further exceed the numbers estimated in the 2005 Forest Plan, or, that differ from conventional drilling activities as anticipated and described in the 2005 Forest Plan, should be delayed or denied.

Response:

The Revised Forest Land and Resource Management Plan was developed with public input from 2001-2005. Impacts from minerals development on National Forests is based on the 2003 Reasonable Foreseeable Development Scenario Report (RFD) developed by the Bureau of Land Management (BLM). The decision to lease minerals, surface availability and stipulations for minerals development on Ozark-St. Francis National Forests was decided in the 2005 Revised Plan. Lands available for leasing are very similar to the previous (1986) plan.

The RFD is a projection by BLM based on the best available information at the time. It is developed by specialists and is subject to peer review. It is not a document that is accepted or rejected by the Forest Service. It is simply information provided to the Forest Service to be used as the best source available to base potential development upon.

Approximately 55% of the Forests are currently leased and have been leased since the 1980s. Leasing of additional areas began in the early 2000s and continues today. When information was revealed that development of the Fayetteville Shale Play was likely to happen on the Forests, the Forest Supervisor requested that BLM develop a new RFD reflecting the current data.

The new RFD that predicted increased levels of development on the Forests was made available to the Forest Supervisor and her staff by the BLM in August of 2009. With the BLM's new development potential in hand it was determined that the Ozark-St. Francis NFs would conduct a Changed Conditions Analysis (CCA). This analysis evaluated if potential gas development on the Forests would affect resources enough to recommend doing a Plan Amendment to change how we manage minerals development. Actual development, as of now, has been far less than was predicted in the most recent RFD. From 2006 through 2013 forty one producing natural gas wells, five exploratory wells, and two non-producing dry holes have been developed on the Forest which is less than that predicted by the revised RFD. During the last two years, no natural gas wells have been developed on the Forest.

An interdisciplinary team of specialists evaluated how predicted potential ground disturbance and other surface activities would affect other resources such as soil, surface water, air, fisheries, endangered species, wildlife, recreation and roads. This disturbance was analyzed in context of the overall disturbance predicted in the revised forest plan. Analysis methods mimicked methods used in the Forest Plan Revision Environmental Impact Statement. Analyses included implementation of Best Management Practices (BMPs) as mandated by the forest plan. BMPs are living documents that change over time and are added to as new information becomes available.

The Supplemental Information Report (SIR) is a letter to the Forest Plan Revision file documenting the results of the CCA. The results revealed that, with the gas well development protections that are in place, a new plan amendment would not be needed.

The SIR does not approve gas well development. It is not a National Environmental Policy Act (NEPA) decision document but is pursuant to NEPA analysis. Each new well proposal goes through the appropriate category of NEPA as determined by law and an Application for Permit to Drill that is approved by the BLM with approval from the Forest Service on the surface use plan.

Comment:

The BLM has no RMP in place for the Fayetteville Shale, and has leased hundreds of thousands of acres in the play without having first fulfilled its obligation to perform an EIS on the impacts of horizontal drilling activities now taking place and anticipated. In simple terms, both the USFS and the BLM are acting without having performed due diligence in amending or conducting environmental impact studies as

required under NEPA, including the prerequisite public review and comments for the full range of activities and combined cumulative impacts of these proposals and activities. As such, these activities are not legal and should halt until forest wide environmental impact statements are current or amended, and have been reviewed by the affected public.

Response:

This proposed natural gas well would not be drilled into the Fayetteville Shale. See the response above, which applies to the rest of your comment concerning NEPA requirements.

Comment:

The EA should indicate whether the well is a conventional vertical well, or a horizontal slick water frack well.

Response:

The proposed well is planned to be drilled horizontally and fractured with nitrogen as disclosed in the Water effects section of the EA on pages 16-23.

Comment:

The EA should specifically identify what types of equipment would be placed permanently on the site, and whether any of that equipment will process, contain, or may potentially leak, spill, or emit toxic substances (gas, solid, or liquid). Those toxic products or emissions should be specifically identified and quantified.

Response:

The Application for Permit to Drill (APD) outlines the type of equipment that will be placed on the site and also includes plans for preventing and responding to leaks and spills of gasses, solids, and liquids. The Water and Air effects sections of the EA on pages 16-26 consider the environmental impacts of potential emissions, leaks, and spills of materials.

Comment:

The EA should indicate the number of vertical drilling shafts anticipated, and if applicable, the number of below ground horizontal bore shafts anticipated, including approximate lengths, and depths.

Response:

One horizontal drilling shaft is proposed at this time, but additional shafts may be proposed in the future, which will require additional environmental analysis after an Application for Permit to Drill is received. The approximate length and depth of the shaft is disclosed in the Application for Permit to Drill and is considered in the Water effects section of the EA on pages 16-23.

Comment:

The EA should identify what types of fracking fluids or compounds would be utilized, their chemical composition, and how those fluids would be transported to and from the well site.

Response:

Nitrogen would be used to fracture the Basham Sandstone Member of the Middle Atoka Formation. The nitrogen and associated fluids and compounds are discussed in the Water effects section of the EA on pages 16-23. The fluids would be transported to and from the site in trucks.

Comment:

The EA should state if the pit would be fenced in order to discourage wildlife from drinking toxic waste water.

Response:

The reserve pit would be enclosed with “page” (net) wire fencing, or similar type of fencing approved by the Forest Service, immediately following construction of the pit. This is included in the Wildlife effects section of the EA on pages 32-36 and is also listed in the Forest Wide Conditions of Approval for natural gas wells.

Comment:

The EA should specify what types of air emissions are anticipated and in what quantities or durations.

Response:

Air emissions are considered in the Air Quality effects section of the EA on pages 23-26.

Comment:

The EA should quantify acceptable noise levels, and what specific limits or regulations will be used to regulate noise levels.

Response:

Project Design Criteria 1 listed in the EA on page 11. details the measures that may be required to reduce noise levels as result of machinery noise. Noise is considered in the Recreation effects sections of the EA on pages 29-31.

Comment:

The EA should estimate the amount of vehicle activity anticipated.

Response:

An estimate of the amount of vehicle activity anticipated appears in the Air Quality effects section of the EA on pages 23-26.

Comment:

The EA should estimate the anticipated life span of the well, if it is a producing well, including anticipated reoccurrences of re-fracking the well or the potential for additional vertical or horizontal well shafts to be drilled in the future. Such information is necessary for understanding and assessing the cumulative impacts of this project.

Response:

Gas wells in the area utilizing the same formation have an anticipated life expectancy of 15 -40 years. There is the potential for re-fracturing of the well at some point in the future. The Water effects section in the EA on pages 16-23 considers the possibility of re-fracturing the well in the future to re-vitalize the well. No additional wells are planned for this location at this time.

Comment:

The EA should also evaluate anticipated VOC's and fugitive emissions anticipated to occur from all potential drilling, flaring, evaporation, and pipeline activities. These emissions should be analyzed for their potential to add greenhouse gases to the environment over the life of the well.

Response:

Anticipated Volatile Organic Carbon compounds and fugitive emissions for all activities associated with the development of the well are considered in the Air Quality effects section of the EA on pages 23-26.

Comment:

The EA should also consider what volumes and types of waste will require disposal over the life of the well, as well as, the risk and impacts of transporting those wastes across USFS lands. Total vehicle trips and estimate emissions. Consider impacts of possible leaks or accidents during transfer and transport of these materials.

Response:

Wastes, waste disposal, waste handling, transport, and the associated risk are considered in the Water effects section of the EA on pages 16-23. An estimate of vehicle trips and emissions is considered in the Air Quality effects section of the EA on pages 23-26.

Comment:

Additional details would be helpful regarding what rehabilitation of the project site entails, who determines when it is complete, who performs the work, and who pays for it.

Response:

The Standard Specifications for Gas Well Drill Sites, Pipelines and Access Roads U.S.D.A. Forest Service Ozark-St.Francis National Forests and the Forest-wide Conditions of Approval contain requirements for reclamation of the site. Also, Project Design Criteria are described in the EA on pages 11-13. The Forest Service as the surface management agency determines when the surface rehabilitation is complete. The Bureau of Land Management determines when rehabilitation of the well below ground is complete. The Company drilling the well is responsible for completing and paying for the rehabilitation of the site.

Comments by Robert Cross President, Ozark Society

Comment:

What is the length of the longitudinal run of drilling?

Response:

The longitudinal run of the drilling is 3250 feet as disclosed in the Application for Permit to Drill (APD) and considered in the Water effects section of the EA on pages 16-23.

Comment:

What is the geology of the overlying and surrounding rock strata?

Response:

The McAlester Formation is present at the surface in the project area. The McAlester Formation rests conformably on the Hartshorne Formation. Beneath the Hartshorne is the Atoka Formation. The target formation for gas extraction is the Basham Sandstone Member of the Middle Atoka Formation. The geology is considered in the Water effects section of the EA on pages 16-23.

Comment:

Has the overlying groundwater been mapped and what streams, ponds, and springs are over the longitudinal run?

Response:

Groundwater, streams, ponds, and springs are considered in the Water effects section of the EA on pages 16-23.

Comment:

What is the estimate of the amount of water to be used in the fracturing fluid?

Response:

The well is planned for nitrogen fracturing and the estimate for the amount of water to be used can be found in the Water effects section of the EA on pages 16-23.

Comment:

What additives will be in the fracturing fluid?

Response:

The fracturing fluids and additives are discussed in the Water effects section of the EA on pages 16-23.

Comment:

What is the estimate of the amount of return fluid from the well and how will it be disposed of?

Response:

The estimate of the amount of return fluid and the disposal of it is found in the Water effects section of the EA on pages 16-23.

Comment:

How much greenhouse gas will be produced by the drilling operation including that by the trucks bringing equipment, construction materials, and chemicals to the site.

Response:

Greenhouse gas is considered in the Air Quality and Climate Change sections of the EA on pages 23-28.

APPENDIX B. MANAGEMENT INDICATOR SPECIES LIST.

MIS – Wildlife Species	Category	Habitat Potential	Occurrence in project area and comments
Rufous-crowned Sparrow	Species of concern	None Poor	No - not discussed in EA* or BE** text due to absence Nearest population is summit of Mt. Magazine
Pileated Woodpecker	Ecological indicator	Good	Yes - addressed in EA
Eastern wild turkey	Demand species	Good	Yes - addressed in EA
Scarlet Tanager	Ecological indicator	Good	Yes – addressed in EA
Acadian Flycatcher	Ecological indicator	Good	Yes – addressed in EA
Prairie Warbler	Ecological indicator	Poor	No – not addressed in EA or BE text due to absence. Populations prefer open seed tree or shelter wood habitats.
Yellow-breasted Chat	Ecological indicator	Poor	No – not discussed in EA or BE. Selected as an MIS for the St. Francis but not the Ozark
Cerulean Warbler	Species of concern	Poor	No – not discussed in EA or BE text due to absence. Breeding population has not been documented on the district.
Northern Parula	Ecological indicator	Poor	No – not addressed in EA or BE. Preferred habitat is riparian areas.
White-tailed Deer	Demand species	Good	Yes – addressed in EA
Black Bear	Ecological indicator	Good	Yes - addressed in EA
Northern Bobwhite	Ecological indicator	Good	Yes – addressed in EA
Red-headed Woodpecker	Ecological indicator	Poor	No – not addressed in EA or BE. Species prefers open timber stands, like seedtree or shelterwood cuts.
Brown-headed Nuthatch	Ecological indicator	Poor	No – not addressed in EA or BE. Another open stand species and drill sites are thickly wooded.
Ovenbird	Ecological indicator	Poor	No – not discussed in EA or BE Occurs on district but not in project.
Largemouth Bass	Demand species	Poor	Yes – addressed in EA
Smallmouth Bass	Demand species	Poor	No – not discussed in EA or BE Occurs on district but not in project.

*EA – Environmental Assessment

**BE – Biological Evaluation

APPENDIX C. TIERED DOCUMENTS AND REFERENCES.

Tiered Documents

U.S. Department of Agriculture, Forest Service. 2005. Final Environmental Impact Statement: Land and Resources Management Plan, Ozark-St. Francis National Forest. Russellville, AR: U.S. Department of Agriculture Forest Service, Southern Region.

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APPENDIX D. INVASIVE SPECIES

Date: May 2001

Regional Forester's List and Ranking Structure Invasive Exotic Plant Species of Management Concern USDA Forest Service, Southern Region

Weed Category	Scientific Name	Common Name
1	<i>Ailanthus altissima</i>	Tree of heaven
1	<i>Albizia julibrissin</i>	Silktree
1	<i>Alliaria petiolata</i>	Garlic mustard
1	<i>Ardisia crenata</i>	Scrated throat
1	<i>Berberis thunbergii</i>	Japanese barberry
1	<i>Celastrus orbiculatus</i>	Oriental bittersweet
1	<i>Cinnamomum camphora</i>	Camphortree
1	<i>Dioscorea alata</i>	Water yam
1	<i>Dioscorea batatas</i>	Air potatoe
1	<i>Dioscorea bulbifera</i>	Chinese yam
1	<i>Eichhornia crassipes</i>	Common water hyacinth
1	<i>Elaeagnus umbellata</i>	Autumn olive
1	<i>Euonymus fortunei</i>	Winter creeper
1	<i>Hydrilla verticillata</i>	Waterthyme
1	<i>Imperata cylindrica</i> (including <i>I. brasiliensis</i>)	Cogongrass
1	<i>Lespedeza cuneata</i>	Sericea lespedeza
1	<i>Ligustrum japonicum</i>	Japanese privet
1	<i>Ligustrum lucidum</i>	Glossy privet
1	<i>Ligustrum sinense</i>	Chinese privet
1	<i>Ligustrum vulgare</i>	European privet
1	<i>Lolium arundinaceum</i> * (= <i>Festuca elatior</i> var. <i>arundinacea</i>)	Tall fescue
1	<i>Lonicera fragrantissima</i>	Sweet breath of spring
1	<i>Lonicera japonica</i>	Japanese honeysuckle
1	<i>Lonicera maackii</i>	Amur honeysuckle
1	<i>Lonicera morrowii</i>	Morrow's honeysuckle
1	<i>Lonicera tatarica</i>	Tatarican honeysuckle
1	<i>Lygodium japonicum</i>	Japanese climbing fern
1	<i>Lygodium microphyllum</i>	Smallleaf climbing fern
1	<i>Lythrum salicaria</i>	Purple loosestrife
1	<i>Microstegium vimineum</i>	Japanese stiltgrass
1	<i>Paederia foetida</i>	Stinkvine
1	<i>Panicum repens</i>	Torpedo grass
1	<i>Polygonum cuspidatum</i>	Japanese knotweed
1	<i>Pueraria montana</i>	Kudzu
1	<i>Rhodomyrtus tomentosus</i>	Rose myrtle
1	<i>Rosa multiflora</i>	Multiflora rose
1	<i>Salvinia molesta</i>	Kariba-weed

1	<i>Sapium sebiferum</i>	Tallowtree
1	<i>Schefflera actinophylla</i>	Octopus tree
1		
Weed		
Category	Scientific Name	Common Name
1	<i>Schinus terebinthifolius</i>	Christmasberry
1	<i>Solanum viarum</i>	Tropical soda apple
1	<i>Sorghum halepense</i>	Johnsongrass
1	<i>Verbena brasiliensis</i>	Brazilian vervain
2	<i>Allium vineale</i>	Wild garlic
2	<i>Alternanthera philoxeroides</i>	Alligatorweed
2	<i>Ampelopsis brevipedunculata</i>	Amur peppervine
2	<i>Arthraxon hispidus</i>	Small carpgrass
2	<i>Bromus inermis</i>	Smooth brome
2	<i>Carduus nutans</i>	Nodding plumelss thistle
2	<i>Centaurea maculosa</i>	Spotted knapweed
2	<i>Cirsium arvense</i>	Canadian thistle
2	<i>Cirsium vulgare</i>	Bull thistle
2	<i>Coronilla varia</i>	Purple crownvetch
2	<i>Egeria densa</i>	Brazilian waterweed
2	<i>Elaeagnus angustifolia</i>	Russian olive
2	<i>Elaeagnus pungens</i>	Thorny olive
2	<i>Eragrostis curvula</i>	Weeping lovegrass
2	<i>Hedera helix</i>	English ivy
2	<i>Kummerowia striata</i> (=Lespedeza striata)	Japanese clover
2	<i>Macfadyena unguis-cati</i>	Catclaw vine
2	<i>Melia azedarach</i>	Chinaberry tree
2	<i>Mimosa pigra</i>	Black mimosa
2	<i>Miscanthus sinensis</i>	Plume grass
2	<i>Myriophyllum spicatum</i>	Spike watermilfoil
2	<i>Nandina domestica</i>	Sacred bamboo
2	<i>Pistia stratiotes</i>	Water lettuce
2	<i>Polygonum caespitosum</i>	Asiatic smartweed
2	<i>Polygonum perfoliatum</i>	Asiatic tearthumb
2	<i>Spiraea japonica</i>	Japanesese meadowsweet
2	<i>Vetiveria zizanioides</i> **	Vetiver grass
2	<i>Wisteria floribunda</i>	Japanese wisteria
2	<i>Wisteria sinensis</i>	Chinese wisteria

* = Applies only to endophyte-enhanced cultivars. All KY31 Tall Fescue is considered endophyte-enhanced.

** = Prohibition does not apply to sterile (nonflowering) cultivars of *V. zizanioides*

APPENDIX E. RESERVE PIT SAMPLING REQUIREMENTS

File Code: 2520/2550/2830-2/1300-1
Route To: (2520)

Date: July 10, 2008

Subject: Pit Sampling Requirements for Gas Well Activities

To: District Rangers, SO Staff

The Forest will continue to request that operators provide a chemical analysis of both sediment and water samples taken from retention ponds/pits/blooiie pits as part of the surface use (36 CFR §228.108) and compliance (36 CFR §228.112) requirements involved with oil and gas resource extraction. This requirement should be included in the operator's Application for Permit to Drill or as a Condition of Approval along with the Decision document. A document which lists these requirements for external distribution can be found attached to this letter, and on the Forest's Minerals intranet website.

The protocols and list of constituents for analysis are as follows:

Two soil/sediment samples and one water sample collected in the presence of a Forest Service representative, and representative of the pit site. Sediment/soil samples should be a representative composite that includes substrate from the bottom and sides of the pit. Samples should be collected and analyzed in accordance with the methods and guidance found in EPA SW-846. An EPA and State approved laboratory should be utilized for sample analysis. Analysis results and QA/QC reports should be submitted to the responsible office.

The collected soil/sediment samples should be tested for the following constituents.

Arsenic	Mercury	Sulfides
Cadmium	Nickel	Chlorides
Hexavalent Chromium	Zinc	Oil and Grease
Chromium	Antimony	TPH – (Total Petroleum
Copper	Barium	Hydrocarbons)
Lead	Cobalt	pH

Alpha/Beta/Gamma Radiological Analysis should be conducted on samples taken from pit locations within Madison, Newton, Johnson, Pope, Searcy, and Van Buren Counties until further notice. Analysis results will be accepted subsequent to pit closure.



The collected water samples should be tested for the following constituents.

Arsenic	Zinc	Total Dissolved Solids
Barium	Chloride	Specific Conductance
Chromium	Nitrate as N	Hardness (CaCO ₃)
Lead	Sulfate	Mercury
Sodium	Oil and Grease	

The addition of several testing components will allow the Forest to continue to fulfill our obligations for surface use management and to accommodate multiple use management objectives of public lands. Questions or assistance with this activity should be addressed to Connie Jankowiak (479) 964-7276 or Michael Crump (479) 964-7513.

/s/ Judith L. Henry
JUDITH L. HENRY
Forest Supervisor

Enclosure

cc: Wayne King
Connie L Jankowiak
Rickey D Adams
James R Bicknell

**OZARK-ST. FRANCIS NF's
Reserve Pit Sampling Requirements**

The protocols and list of constituents for analysis are as follows-

Two soil/sediment samples and one water sample collected in the presence of a Forest Service representative, and representative of the pit site. Sediment/soil samples should be a representative composite that includes substrate from the bottom and sides of the pit. Samples should be collected and analyzed in accordance with the methods and guidance found in EPA SW-846. An EPA and State approved laboratory should be utilized for sample analysis. Analysis results and QA/QC reports should be submitted to the responsible office.

Soil/sediment samples tested for the following constituents:

Arsenic	Mercury	Sulfides
Cadmium	Nickel	Chlorides
Hexavalent Chromium	Zinc	Oil and Grease
Chromium	Antimony	TPH – (Total Petroleum
Copper	Barium	Hydrocarbons)
Lead	Cobalt	pH

Alpha/Beta/Gamma Radiological Analysis should be conducted on samples taken from pit locations within Madison, Newton, Johnson, Pope, Searcy, and Van Buren Counties until further notice. Analysis results will be accepted subsequent to pit closure.

Water samples tested for the following constituents:

Arsenic	Zinc	Total Dissolved Solids
Barium	Chloride	Specific Conductance
Chromium	Nitrate as N	Hardness (CaCO ₃)
Lead	Sulfate	Mercury
Sodium	Oil and Grease	